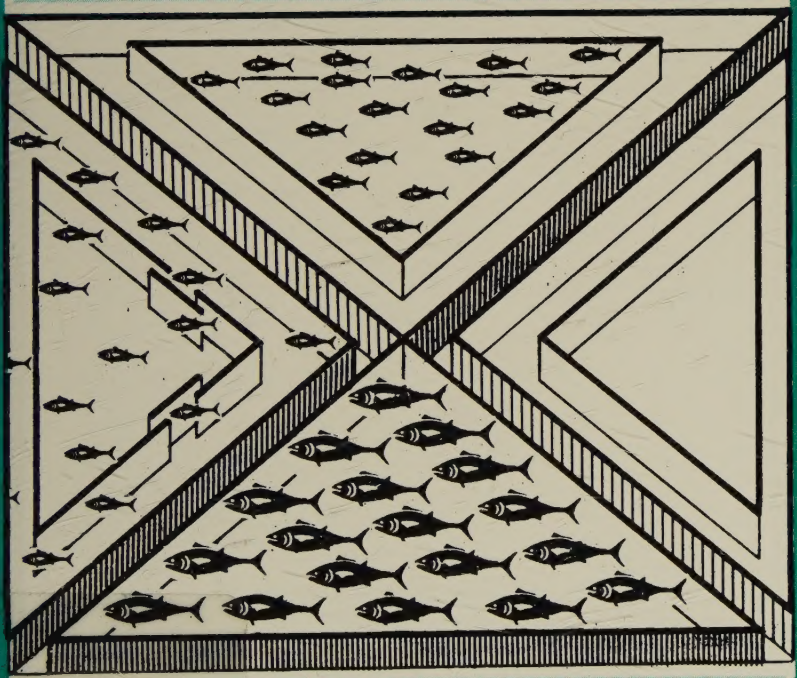
Options for the management of tuna fisheries in the Indian Ocean



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FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

Options for the management of tuna fisheries in the Indian Ocean

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it is evident
that new conceptions
and approaches to management
are required

Global Strategy for Fisheries Management
and Development (FAO 1984)

PREPARATION OF THIS DOCUMENT

Tuna fishing is increasing in the Indian Ocean. The coastal states are concerned about the needs for management of the stocks and are in the process of examining alternative arrangements that might be adopted. This paper discusses some possible options for ideal arrangements and innovative approaches. It is designed to stimulate discussion and facilitate the process of achieving an effective management regime.

The views expressed in this paper are those of the authors and do not necessarily reflect the views of FAO. The authors wish to acknowledge with gratitude the contributions of Jacek Majkowski to the study.

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ABSTRACT

The study examines possible options for the management of the tuna fisheries in the Indian Ocean. It begins with an assessment of the issues with regard to the four main functions of fisheries management: (1) the acquisition of information; (2) regulation of fisheries; (3) enforcement of the management measures; and (4) the allocation of the net benefits from the regime. The issues are examined in terms of both economic and legal aspects.

Possible approaches to the resolution of these issues are then addressed. This includes discussion of existing arrangements in other areas of the oceans, which have largely failed to achieve effective management and to produce benefits to the members. It discusses, in designedly speculative and theoretical terms, the new approaches that might be taken. It concludes that new conceptions and approaches to management are required to achieve optimum benefits from the fisheries.

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OPTIONS FOR THE MANAGEMENT OF TUNA FISHERIES IN THE INDIAN OCEAN

1. INTRODUCTION

1.1 - Objective of the study

The objective of the study is to examine options for the management of the tuna fisheries in the Indian Ocean, in terms of desirable long run elements and against the background of experience of other international fishery bodies. The terms of reference are as follows:

(i) assess present and future management issues;

(ii) review the experience gained by other international fisheries management bodies of relevance to the problems faced in managing Indian Ocean tuna;

(iii) identify problems and possible approaches for the fulfillment of the three basic management functions, i.e., information acquisition, management regulations and enforcement, within and without nationals EEZs;

(iv) identify the criteria by which the tuna resources can be allocated between coastal and noncoastal interests as well as between different types of gear.

The terms of reference also call for addressing the legal aspects of each of the above elements.

1.2 - Organization of the study

The study is organized to parallel the terms of reference. Section II presents a review and assessment of management issues as seen by the consultants. Section III considers possible approaches to these issues in light of prior experience and other alternatives. The issues are considered in terms of the various functions of a management body, including acquisition, analysis and dissemination of information; regulations; enforcement; and allocation. Section IV highlights some considerations with regard to the formulation and implementation of an Indian Ocean tuna fisheries body to achieve conservation and optimum utilization of the resources.

We also include a brief statement and review of basic management concepts in order to clarify the view of fisheries management utilized in this study.

1.3 - Objectives and functions of fisheries management

The objective of management is taken to be the optimum utilization of the resources, which has two basic elements: (a) the achievement of the maximum net benefits from the resources and (b) the distribution of costs and benefits in a manner acceptable to all participants. The first element relates to the production aspects and the efficiency in the use of the resources while the second relates to the allocational aspects, the problems of "who gets what". The issues relating to production and efficiency in the use of resources are often referred to as conservation objectives.

It needs to be noted immediately that, so far as has been discovered from our necessarily incomplete survey of documentation, none of the current discussions of a new Indian Ocean fishery body makes reference to these, or any similar, objectives for management. Although references to "optimum utilization" and to increased benefits are sometimes made, the notion of maximizing *net* benefits and allocating them is not apparent. This study emphasizes the importance of these two objectives.

It should also be noted that, with a few specific exceptions, no multinational or international fisheries bodies dealing with common or straddling stocks have yet achieved optimum utilization as defined here. They have neither increased net benefits to their members nor achieved acceptable and stable patterns of allocation. The only possible exceptions are the International North Pacific Fur Seal Convention (which no longer exists), the Pacific Salmon Commission and the South Pacific Forum Fisheries Agency (to which FAO contributed important technical assistance). Aside from these examples, the history of the international fishery bodies is marked by failure. To continue to follow the models of the past is to continue along a fruitless path. We thus take as a basic premise for the study, the statement of the Global Strategy for Fisheries Management and Development that "new conceptions and approaches to management are required."

Although the terms of reference for this study are restricted to the tuna fisheries of the Indian Ocean, any management regime that is adopted should have a broader focus. Rapid changes are occurring in oceanic fisheries both in terms of the development of gear and with regard to the species being sought, as is indicated by the dramatic growth in the use of specialized high seas drift nets in squid fisheries. It is not unreasonable to expect the development of new technologies which will permit future fisheries to target on squid or perhaps other stocks in the high seas areas of the Indian Ocean. To the extent that such stocks, like the tunas, also occur both within and outside EEZ's, the problems of management will be the same. Thus, a regime set up to deal with tunas should have the flexibility to cover other species as well.

In this connection, we also note that limiting consideration solely to an Indian Ocean tuna management body may not lead to an optimal result. It may well be that, in the long run, an Indian Ocean management agency cannot by itself achieve long term increases in net benefits, let along maximize them and allocate them appropriately. Tuna has a global market and is caught by fleets capable of fishing throughout the world. The management of only a portion of the resource is likely to lead to lost opportunities and inadequate conservation and management measures. There may be a need for a global tuna management agency, of which an Indian Ocean body would be one component (Joseph 1990).

1.3.1 - Production aspects of management

To achieve the maximum net benefits from the resources it is necessary to deal with both the total benefits that can be produced and the total costs involved in their production.

Benefits refer to all values to society that can be produced from the resources. Although the primary benefit from any such commercial operation as tuna fishing is that of economic revenues, other benefits may also be important to different States, including employment opportunities and protein supplies. The definition implies that the conservation of tuna stocks is not a benefit in itself except insofar as it is necessary to prevent the extinction of a stock or prevent incidental harm to the ecosystem. Conservation measures are, rather, a means to ensure a desirable level of supply from the resources. A desirable level is one which can only be determined by taking into account the costs and benefits associated with achieving it.

Benefits also include, in this paper, the values linked to the harvesting sector both before and after the harvesting operations. Backward linkages include the provisioning of vessels and other activities related to the supply of the inputs used in fishing operations. Forward linkages relate to the post-harvest sector and include the processing and distribution of the products.

It is also important to consider future benefits as well as those that are immediately obtainable. This can generally be characterized as meaning that the benefits should be "sustainable" over time. A fully proper evaluation, however, should discount future benefits (as well as future costs) to their present worth and should also take account of anticipated changes in the prices of, and interrelationships among, capital, labour and resources.

Costs are also broadly defined. There are the direct costs including those of capital and labour in harvesting, supply and marketing operations. But there are also important costs involved in fulfilling the management functions as well as

costs resulting from side effects of the operations which are external to the operations.

The important management costs are those of acquiring the information necessary for management and of ensuring compliance with the management measures (monitoring, control, surveillance and judicial processes). Transaction costs (those of negotiating agreements, formulating and implementing management measures) also need to be considered.

External costs include harms that may be done incidentally to the tuna fishing operations. In some cases, the external costs may relate to the effects of one kind of fishing operation on another, such as the effects of industrial fisheries on artisanal fisheries or of the use of one kind of gear on another kind. Incidental catches of non-tuna species may be important, particularly with regard to such species as sharks which are highly vulnerable to over-fishing or to marine mammals whose protection is important to some states which may have an influence on fishing operations because of market controls. Environmental impacts of tuna operations, such as the effects of abandoned nets, must also be considered as costs.

In open access fisheries, the benefits and costs of management generally accrue to different parties. Unless specific arrangements are made, the private sector usually receives the benefits in the form of higher catches per unit of effort (and higher average incomes) while the public sector tends to bear the full costs of implementing the management measures. Also, with regard to the fishing vessels, payments for access may be made by the states whose flags they fly rather than by the owners of the vessels (e.g., EEC vessels fishing in Morocco's zone, U.S. tuna vessels in the South Pacific) or the states of foreign vessels may have acquired preferential terms of access for their fishermen. Although perhaps based upon extraneous political concerns, such arrangements constitute forms of subsidies to fishermen and provide a stimulus to over-invest. Arrangements can be made, however, to arrive at a closer incidence of benefits and costs. Such arrangements are a vital element in any fisheries management regime.

To achieve the maximum net benefits from a fishery, several functions must be fulfilled. These are analogous to the functions fulfilled by resource owners where satisfactory property rights are in effect, as in the case of agriculture. There are three basic functions: (a) information acquisition; (b) control over production and the inputs of capital and labour (regulation); and (c) enforcement. Fisheries management cannot be effective unless there is satisfactory fulfillment of all three of these basic functions, as well as the ability to deal with the problems of allocation.

1.3.2 - Allocation aspects of management

Allocation deals with the question of who gets the benefits and who bears the costs. The difference between the production and allocation aspects is significant since objective criteria can be used to assess the degree of efficiency resulting from the former whereas the distribution of benefits and costs is basically a process of negotiation among the concerned parties and thereby a political question. The two elements, however, cannot be entirely separated.

The objective of allocation is to arrive at a pattern of distribution such that all parties who are in a position to significantly affect the arrangements feel that they are better off by complying with the arrangements than by breaking them. The question is, thus, not so much a question of "equity" (i.e. what a particular party *should* receive) as it is a matter of "acceptability". Without the acceptance of the arrangements by the important participants, it is unlikely that the system will be stable.

2. ASSESSMENT OF ISSUES

The following is a brief assessment of the issues in management of Indian Ocean tuna. We identify these issues as the management functions of (1) acquisition of information, (2) regulation, (3) enforcement, and (4) allocation of net benefits. The discussion mentions only the significant issues involved with each function, including their legal aspects. The detailed alternative measures for implementing the function are discussed under the later heading of "Possible Approaches."

2.1 - Acquisition of information

The important issues are whether information is needed for management, given the objectives and functions described in the Introduction; what this information consists of; how much information is needed; and who should be responsible for gathering, analyzing and disseminating the information.

2.1.1 - Whether information is needed for management

Whether information is needed for management poses the question of whether ignorance is more costly than knowledge. It is presumed here that if the objectives of management are to produce the maximum net benefits from a fishery and to allocate (distribute) these benefits, then information is clearly required that will inform the decisions to be made in seeking the objectives. Unless useful information is collected and analyzed, those who should benefit from a resource are likely to receive no benefits or receive less than their expected share. As noted below, the question is raised because the acquisition of information is not cost free.

2.1.2 - What information is needed

All types of information relative to production and allocation of benefits should be sought out and analyzed by those responsible for management. Presently the information collected on Indian Ocean tuna is almost wholly concentrated on biological data (length frequency, etc.) and physical measures of fishing activity (catch, effort by area and species) used for biological modelling. An illustration of this narrow orientation can be found in the Report of Expert Consultation on Stock Assessment of Indian Ocean Tuna (FAO 1990: hereinafter referred to as the Expert Consultation). But for the purposes of maximizing net benefits and allocating them it is essential to acquire information on the economic and social factors of the fisheries.

2.1.3 - How much information is needed

Important sub-issues arise in considering how much information is needed for management decisions. One is that managers should observe the economic principle of marginal returns and costs of information. At some stage the cost of producing additional information is not worth the additional benefit produced. The question here is whether the expenditure for further information is needed to improve the production of net benefits or assist the allocation of such benefits. Presently available information may be sufficient to take actions that will improve benefits, and expenditure on further information may simply increase costs unnecessarily.

Traditionally in fisheries management, there was reluctance to recommend conservation measures unless there were "complete" data available to support the need for them. Later, it was recognized that this emphasis on complete data was excessive and that there was never a final set of data, leading to the indefinite postponement of management measures. Subsequently, to avoid this impasse, the notion was that it was appropriate to adopt measures taking into account the "best scientific evidence available".[1] This standard is clearly relative, since the best available may be relatively weak. Nonetheless measures can be instituted to improve benefits.

A recent idea concerning the amount of evidence needed for conservation decisions is of an entirely different order and raises a potent future issue. It is now being suggested, in the case of the use of driftnets on the high seas, that as a precaution against excessive impact on a target or incidental stock, there should be no fishing at all with such gear in the absence of scientific evidence, i.e., if there are no available scientific data on the impact of exploitation, there should be no exploitation.[2] The principle here is that of avoiding the risk of damage to a stock because information is lacking entirely or otherwise inadequate. This approach reverses the normal burden of proof which calls for adoption of management measures after appraising a body of data about the stocks in question. Instead, if data are not available at all or are inadequate, the fishery is

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[1] This formulation is the one used in Article 61 of the 1982 Convention on the Law of the Sea. Another formulation calls for measures "based upon the best scientific evidence available", which implies greater emphasis on scientific considerations than "taking into account".

[2] This is what was recommended by the Expert Consultation in the light of the General Assembly moratorium resolution and in noting that there were no data available on the effect of driftnet fishing on marine mammals and other non-target resources of the high seas of the Indian Ocean.

halted because there is presumed to be a risk of depletion or of excessive incidental catches. It is to be noted that the Expert Consultation elsewhere refers to several instances of uncertainty concerning the impact of fishing on target stocks, but specifically concludes that no management measures are needed. While this may be sound from the biological perspective, it is an entirely different approach from that adopted for high seas drift gillnet fishing.[3] Below we also note that this conclusion may be unwarranted from the broader perspective of realizing greater net benefits from tuna fishing in the Indian Ocean.

2.1.4 - Who should be responsible for gathering, analyzing and distributing information

The issue here concerns the credibility and cost of producing information. What should be the relative roles of coastal state, distant water fishing nations, and a possible international fishery body. Coastal states have complete control over access to their EEZ's and other states require permission to do research in the EEZ. The fishery, however, is prosecuted not only in the EEZ but also on the high seas and management requires information over the entire range of the stock. Full information therefore requires cooperation among coastal and high seas fishing states. How this is accomplished and who bears the costs are important issues in the Indian Ocean.

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[3] The Expert Consultation was referring specifically to the high seas drift net fishing by Taiwan (Province of China). However, the following passage suggests that this is not the only one on the high seas of the Indian Ocean: "At the request of the Secretariat, the experts provided significant information on the status of drift gillnet fisheries in their countries. The only distant water drift gillnet fishery fleet operation on the high seas in the Indian Ocean is Taiwanese, but there are many artisanal and semi-artisanal fleets operating in the region from Bangladesh, India, Indonesia, the Islamic Republic of Iran, Malaysia, Oman, Pakistan, Sri Lanka, Thailand and Yemen." The Report does not state whether these fisheries operated on the high seas or only within EEZ's. The net sizes in these activities are small but the number of nets is large. It was apparently these activities which led to the conclusion: "Taking into account the need to gather more information on the impacts of drift gillnets on tuna and tuna-like species, the Consultation recommended initiating or improving the collection of data on catches, their species and size composition and fishing effort." Report of Expert Consultation, sect. 7. Drift gillnet fishery (1990).

2.1.5 - Legal aspects of acquisition of scientific information

Information needed for management of tuna species may require data about stocks within national jurisdiction. To the extent this might involve scientific research within that area, marine scientific research, including fishery research, is subject under contemporary international law to the consent of the coastal state. Accordingly, any research projects relating to tuna that must be executed within 200 miles will require approval by the coastal state concerned. If such research is part of an international research programme or under the auspices of an international organization, further coastal state permission might not be required if the conditions of Article 247 of the 1982 Convention were applicable and had been satisfied. It is clear that the Article 247 arrangement is not part of customary international law. In the area beyond 200 miles, marine scientific research may be carried out as an exercise of freedom of the sea.

With respect to the kind of information needed, the constraint imposed by proprietary information may raise a legal issue. This will require that this information be handled so that it is protected from general distribution. This may require, in turn, that a management body be constructed so that proprietary information is not disclosed to the section dealing with enforcement.

An important legal issue arises about the quantity of information required for management and the kind of decisions that are made in light of the amount or quality of information available. The specific legal issue concerns whether the so-called precautionary principle is recognized as customary international law. This principle is variously formulated, which suggests that it is still not generally recognized as a coherent binding principle. One formulation is that in the absence of any scientific information about the consequences of an activity, such as the impact of fishery exploitation on a particular target stock or incidental catch or on the larger ecosystem, the risks of such impact must be avoided by refraining from the exploitation. This was the conclusion of the Expert Consultation about driftnets, citing a non-binding UN Resolution (44/225). Under another version of the principle, exploitation of a fishery must be terminated if the risk of continued exploitation might cause an irreversible outcome, even though the perception of risk is supported by inadequate scientific information. The latter is a considerably more restricted form of the principle. Resolution of this problem is not unique to the Indian Ocean tuna fisheries.

The existing legal regime for marine scientific research, mentioned above, is pertinent in considering who should be responsible for gathering, analyzing and distributing information. Unless they are prepared to permit research inquiries within their jurisdiction, coastal states will need to assume this responsibility. If such inquiry is allowed, then the question is how to draft the principles and procedures which distinguish this from other research so that it may be routinely conducted.

2.2 - Regulation

There are two basic issues regarding the regulation of tuna fisheries in the Indian Ocean:

1. Are regulations necessary to meet the objectives of: (a) the maximization of net benefits and (b) the allocation of benefits?

2. If regulations are necessary, who should have the authority to formulate, adopt and implement them?

2.2.1 - Necessity for regulations

The issue of the necessity for management regulations has been raised by several bodies concerned with Indian Ocean fisheries. Although there is general agreement that management is desirable, the meaning of management and the implications for regulations are not always wholly understood.

For example, at the recent Expert Consultation, the question of the need for management measures was addressed solely with regard to the biological status of the stocks. It was noted that yields of some stocks might be at or close to their maximum levels and concern was expressed about the rapid growth in certain kinds of fishing gear (e.g., driftnets for albacore and purse seines for surface yellowfin) and the possibility that these might affect catch rates by other gear. Nevertheless, in all cases except for southern bluefin, the consultation offered no management regulations.

Some evidence indicates, however, that management regulations would be desirable in some tuna fisheries to achieve the objectives of maximum net benefits and acceptable allocation. To the extent that tuna harvests are at or close to the MSY level, it is probable that economic overfishing is already occurring. The Expert Consultation indicates, despite uncertainties, that catches of albacore and bigeye are in the MSY range. Even in the skipjack fishery, where yields appear to be well below their maximum levels, appropriate regulations may be desirable to prevent economic waste and will be necessary for the implementation of allocation schemes.

The issue as to the need for management regulations must also address the kinds of regulations, and whether the regulations are directed solely at biological yields or deal more broadly with economic and social benefits.

2.2.2 - Location of regulatory authority

An associated issue is that of the location of the authority for formulation, adoption and implementation of regulations. Within EEZ's, the authority clearly lies with national governments to the exclusion of other states, although the states may wish to create a joint authority for the management of shared stocks. Outside of national jurisdiction, the critical issue is that of determining the role of coastal states vis-a-vis the role of non-regional fishing states. Likewise for the region as a whole, the important issue is the relative authority of coastal states, the distant-water fishing nations (DWFN), and the balance between them in an international fishery body or bodies.

2.2.3 - Legal aspects of the regulation

The basic regulatory problem in the Indian Ocean area concerns the objectives to be attained and the mechanism or mechanisms for fulfillment of the regulatory function. In earlier discussion we noted the desirability of specifying the objective as optimum utilization (measures concerning efficiency and measures concerning allocation).

There is no special legal problem connected with establishing regulations for the objectives specified within the EEZ. None of the currently effective international fishery bodies has regulatory authority over high seas tuna fishing independent of flag state consent. Coastal and fishing states can, by agreement, delegate any prescriptive authority they consider desirable to a fishery body they establish.

Under the 1982 Convention on the law of the sea and under customary law, the coastal state may prescribe conservation regulations for any fishing on species within its jurisdiction, subject only to the requirement, in the case of the Convention provision on highly migratory species, that it cooperate with the nations who fish in the region.[4] Assuming cooperation does not result in appropriate regulation, the coastal state is authorized under contemporary law unilaterally to prescribe regulations to be observed by foreign vessels fishing within its EEZ, including provisions regulating access to the EEZ, the specification of the total allowable catch and the conditions under which it is taken.

The situation is less clear regarding the promulgation by the coastal state of management regulations for tuna fishing outside the coastal states' EEZs. Some interpret the Convention on the Law of the Sea as insulating high seas fishing

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[4] See articles 56, 61, 62 and 64 in Annex I attached.

from any regulatory competence of adjacent coastal states.[5] In this interpretation, high seas fishing is an exercise of freedom of the seas (freedom of fishing) and only the flag state is authorized to prescribe regulations for its vessels on the high seas. Any other regulation depends on flag state consent.

Another interpretation of the Convention is that article 116 declares that fishing on the high seas is subject to coastal states rights, duties and interests, specifying article 64 as among the relevant articles to which this injunction is directed. This article might be interpreted to subject high seas fishing to coastal state regulatory measures designed to safeguard its rights, duties and interests.[6] There has been, as yet, no unilateral coastal state regulation of tuna fishing outside the EEZ and the scope of article 116 in relation to other provisions on high seas fishing remains to be clarified.[7] A difference about the extent of coastal state authority over the freedom to fish tuna stocks on the high seas will be an important issue. As will be noted below in reference to possible approaches to allocation, the Agreement Creating the Eastern Pacific Tuna Fishing Organization (concluded July 21, 1989; not in force) might be interpreted to provide for a claim

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[5] At the time this study was written, the United States contended that under Article 64 of the 1982 Convention and under applicable customary law, tuna within an EEZ and those on the high seas were beyond coastal state jurisdiction, unless agreed otherwise. In October 1990, the United States Congress amended U.S. legislation to include tuna within U.S. EEZ jurisdiction. But the United States and other nations continue to contend that high seas fishing for tuna is subject to regulation only through international agreement. However, this position may perhaps be in the process of modification regarding fishing for stocks straddling the high seas/exclusive economic zone boundary and for some other high seas fishing as well. Moreover, the principle of freedom of fishing on the high seas may also be modified in the future in the context of use of certain types of gear taking tuna on the high seas. Driftnets and other gear taking tuna (and possibly other species) may be affected by such a modification if it should occur.

[6] See Miles and Burke (1989) and Conclusions of the Conference on the Conservation and Management of Living Resources of the High Seas (1990). The latter calls for management regimes for high seas fishing, including regimes for tuna, to be consistent with the coastal state conservation measures within the EEZ.

[7] One proposed clarification of the effects of Articles 63(2), 116, 117 and 119 of the 1982 Convention has been adopted by the North Atlantic Fisheries Organization. A joint proposal by the EEC and Canada emphasizes the significant role of a regional fisheries organization to prescribe conservation measures for high seas fishing with which non-members should comply (NAFO 1990 in Annex II of this paper).

by the signatory states to sovereign rights over tuna "adjacent to and within 200 miles of their coastlines", meaning adjacent to 200 miles.[8]

2.3 - Enforcement

2.3.1 - Is enforcement necessary

It may seem anomalous to ask whether enforcement is necessary for management of tuna. But if there are to be no effective regulations for tuna, then obviously no serious question of enforcement arises. If regulations are required for achieving the management objectives identified above, then it follows that an enforcement and compliance regime is required.

2.3.2 - Who should have enforcement authority

Because a regulatory regime is needed, the question of enforcement competence arises, as well as the need for compliance measures. Coastal states certainly must have competence to enforce any regulations effective in areas subject to coastal state jurisdiction. However, the practical obstacles to effective enforcement at sea by developing coastal states are serious. Measures need to be designed which minimize the need for physical enforcement actions. For this reason, it is probable also that an international body should have competence to carry out some or all of the enforcement function through, for example, provision of an observer scheme or a register of fishing vessels. In addition, the problem arises of devising compliance measures to be implemented by distant water fishing nations.

The question of costs of enforcement arise, as was the case with acquisition of information. The economic principle of marginal costs equaling marginal revenues is also applicable in the enforcement context, so that the extent of enforcement is an issue. In addition, determining who bears these costs is important.

2.3.3 - Legal aspects of enforcement

Under contemporary international law, coastal states have complete enforcement authority within the EEZ. The 1982 Convention on the Law of the

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[8] Otherwise the words "adjacent to" appear to be redundant and have no effect.

Sea, however, restricts such authority by prohibiting the imprisonment or any other form of corporal punishment (unless the states concerned agree otherwise), for fishery violations within the EEZ (Article 73). In practice, many states continue to provide for such penalties.

Forfeiture of fishing vessels and gear is not an uncommon provision for violation of coastal state laws. However, the Convention provides (Article 73) that vessels must be released from custody only upon posting of a reasonable bond or other security, which might accomplish an indirect forfeiture. The inference is that forfeiture is prohibited as an initial direct security measure but not as a final penalty.

Beyond the exclusive economic zone, the 1982 Convention and customary law make no provision for fishery enforcement authority by coastal or other states. Even if it were recognized that a coastal state had superior rights regarding conservation of a stock of tuna on the high seas, it is difficult to find authority for enforcement of that right by the coastal state concerned. Enforcement on the high seas thus requires either an international agency or special measures that obviate the need for physical enforcement activity.

2.4 - Allocation

Perhaps the most difficult issue facing the management of Indian Ocean tuna is that of allocation which can be expressed in two questions:

1. Is allocation necessary?

2. If so, who shares in the allocation?

2.4.1 - Necessity for allocation decisions

Under the present system the coastal states receive benefits from foreign fishermen through the agreements they make for fishing within their own EEZ's, as well as incidental benefits they may derive from the use by foreign fishing vessels of their ports and processing facilities.

Outside of national jurisdiction, allocation is based simply on the fishing effort of the fishing states, and no explicit decisions are made. If the open access condition remains in the areas beyond national jurisdiction, the allocation issue is irrelevant. Any potential economic rents that might become available are dissipated because of over-capitalization resulting from open access.

The question as to the necessity for allocation decisions thus depends upon the adoption of regulatory measures that allow for efficiency in the use of resources or upon the adoption of explicit decisions to change the present pattern of distribution in the Indian Ocean which essentially allows for free access to high seas tuna resources. This same pattern prevails everywhere except in the western Pacific where one distant water fishing nation (the United States) pays for access both to areas of national jurisdiction and the high seas regions beyond.[9]

2.4.2 - Who shares in the allocation

Potential participants in the sharing system include the coastal states, the landlocked and geographically disadvantaged states within the region and the non-regional states fishing within the Indian Ocean. Detailed issues include: the determination of who shares in the benefits; the area within which resource benefits are to be shared (solely outside national jurisdiction or both within and outside); what is to be shared; and how the amounts of shares are to be determined. These are the most fundamental issues of fisheries management and the most controversial.

2.4.3 - Legal aspects of allocation

A major new technique for allocation of benefits and costs of fishing is the establishment of an exclusive economic or fishing zone. Under contemporary international law, the consequence of this action is to provide a coastal state with the authority to realize revenues and other benefits from fishing within the area claimed by imposing fees for access to the area or by extracting benefits in kind or in other forms (such as research and information). This method also applies to tuna fishing, since these species also are subject to national jurisdiction within an EEZ. The only significant dissenter from this view of international law is the United States.[10] However, while continuing to maintain its

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[9] This exception is based on the belief that the U.S./Pacific Island Nations treaty applies to an area defined in article 1 to include high seas as well as waters subject to the national jurisdiction of the states. The total fees paid by the U.S. Government and industry therefore include payment for the high seas harvests, although the treaty does not provide for an accounting of such harvests. See Law of the Sea Bulletin, No. 10, p. 24-5 (Nov. 1987).

[10] After completion of this study, the United States Congress amended its national fishing legislation (the Magnuson Fishery Conservation and Management Act) to include tuna within its EEZ jurisdiction. At this writing, no Executive Branch action had been taken on this amendment but it is not likely to be vetoed.

position that tuna are not subject to coastal state jurisdiction in an EEZ, the United States has entered into an agreement with the Pacific Island nations which in effect recognizes their jurisdiction and makes payment for access to tuna within the combined areas of national jurisdiction of these states and also for high seas harvests. This effective change of position by a major tuna fishing state establishes that there is no serious question that extension of national jurisdiction to EEZs in the Indian Ocean is an acceptable method of allocating benefits and costs from tuna fishing.

The legal issues about allocation of benefits in the area beyond national jurisdiction are considerably more complicated. The 1982 Convention on the law of the sea makes provision for freedom of fishing on the high seas and also has very general provisions concerning the management of straddling stocks, of which tuna is an instance. It is not the place here to discuss the details of this problem, but rather only to note that allocation of benefits of fishing on straddling stocks of tuna might involve interpretation and application of various provisions in the 1982 Convention (Articles 56, 61, 63 and 116). It is possible that a coastal state may claim a larger share of the benefits of fishing for tuna in a region of the ocean on the basis of the view that its rights and interests in tuna stocks are superior to those of distant water fishing states.

Under the 1982 Convention there is also a major difference in resolving disputed issues, depending upon whether the dispute relates to the exclusive economic zone or the high seas beyond. Disputes with a coastal state over EEZ fishing issues are not subject to compulsory dispute settlement under the Convention, while disputes over high seas issues are subject to such settlement. Allocation questions concerning the high seas are therefore amenable to third party settlement as a matter of course,[11] while EEZ disputes require other approaches which could take the form of economic sanctions, political negotiations, or judicial actions using national fora.

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[11] The third party under the 1982 Convention is provided for in part XV and could include any entity agreed by the disputing states. If no entity is agreed between them, the treaty provides for arbitration pursuant to Annex VII of the treaty. Proceedings under this annex are compulsory and the outcome is binding on both parties.

3. POSSIBLE APPROACHES

3.1 - Acquisition of information

3.1.1 - Prior experience

With the exception of the South Pacific Forum Fisheries Agency, all prior experience in handling the acquisition of information for tuna management is colored by the fact that management has not included a focus on maximizing net benefits or arranging for allocation. Thus the kinds of information that have been acquired are those pertaining mainly to biological and technological aspects of the fisheries.

The principal repositories of past experience in carrying out the information function with regard to tuna are the International Commission for the Conservation of Atlantic Tuna (ICCAT) and the Inter-American Tropical Tuna Commission (IATTC). These bodies represent the polar extremes in performing this function. In ICCAT the collection and dissemination of information is done by national governments and the Commission serves the purpose of bringing this information together. The IATTC, on the other hand, is noteworthy because it employs a scientific staff composed of persons whose sole loyalty is to the international commission and whose mission is to acquire information and analyze it for the benefit of the Commission.

The utility of the IATTC independent staff approach lies in enhancing the credibility of the basic data and analysis. This was the major reason for adoption of this approach. At the time of its creation in 1949 by agreement between the U.S. and Costa Rica, the prospective members from Latin and South America did not have the scientific personnel and infrastructure required for the tasks involved. While the United States did have these assets, it was clear that a purely national approach utilizing only U.S. expertise would not command the trust and respect of the developing states concerned, given both the history of relations among these states and the United States fishing fleet dominance of the harvest from the area.

To the extent that the Indian Ocean coastal states have the same scientific characteristics of the eastern Pacific coastal states, in comparison to the developed distant water states in the Indian Ocean, an independent scientific staff seems warranted. Adoption of the IATTC approach is indicated under those conditions.

The South Pacific Forum Fisheries Agency is unique because its information function extends beyond statistical and biological data to include collection and

dissemination of information on management procedures, legislation and agreements adopted by other states and relevant information on prices, shipping, processing and marketing of fish and fish products. Furthermore, in the major international agreement in the Western Pacific (between the U.S. and the Pacific island nations), the member states of the FFA and the U.S. declare their desire to maximize benefits flowing from the development of fishery resources within fisheries zones of the Pacific island parties.

Most of the scientific research concerning tuna in the South Pacific is undertaken by the South Pacific Commission (established in 1947). "The SPC has conducted a great deal of research on tunas and billfish and has established a regional oceanic fisheries data base but, unfortunately, this covers only a restricted area in the Western Pacific" (Joseph 1990, p. 7). However, the SPC is not uniquely focussed on tuna and its future conduct of research on tuna is not assured (Joseph 1989, p. 13).

At present, catch and fishing effort data for tuna and tuna-like species are collected by individual coastal and distant-water states involved in the Indian Ocean fisheries. Also, these states carry out length-sampling of catches. In Indonesia, Pakistan, Thailand and Sri Lanka, the collections and sampling are partly undertaken by the Indo-Pacific Tuna Development and Management Programme (IPTP) in Colombo, Sri Lanka, which is funded by the United Nations Development Programme, Japan, the European Economic Community and participating countries, and executed by the Food and Agriculture Organization of the United Nations. IPTP has been assisting the states in the design, monitoring and adjustment of the collection and sampling schemes. It has also been providing training for the personnel involved in the collections and sampling. IPTP has played an important role also in the design, financial support and execution of several small-scale tagging programmes off Indonesia, Maldives, Philippines and Malaysia. The data resulting from these programmes are stored by IPTP.

The resulting data are submitted by the individual states to IPTP for computer processing and storage. IPTP also publishes summaries of the data and offers the data in forms suitable for computer analyses if requested by the states, but such requests are infrequent.

The data available from IPTP include:

(i) annual catches by state, species and FAO statistical area (36 states including DWFN's and soon also to include foreign flag vessels based in Indonesia and Reunion (France)),

(ii) annual catches by state, species, fishing method and vessel type (23 states),

(iii) catches and fishing effort by state, species, fishing method, five degree squares and month for industrial fisheries (10 states, not available for India, Indonesia and USSR),

(iv) catches and fishing effort by state, species, fishing method and month for artisanal fisheries (8 states),

(v) catch length-frequencies by state, species, fishing method, five degree squares or larger areas and month or quarter for industrial fisheries (5 states) and

(vi) catch length-frequencies by state, species, fishing method, and month for artisanal fisheries (6 states).

Since the establishment of IPTP in 1985, the availability, coverage and quality of data have improved very significantly.

Research into tuna and tuna-like stocks and fisheries in the Indian Ocean is carried out mainly by the individual states involved in these fisheries. The role of IPTP is mainly to facilitate the exchange of data and scientific information through correspondence, workshops, Expert Consultations and other meetings. It also fulfills some functions in the coordination and financial support of research carried out by the individual countries and the training of scientists.

The research capacity of IPTP itself is very limited. Taking into account, as concluded by the 1990 Expert Consultation on Stock Assessment of Indian Ocean Tuna, that most Indian Ocean coastal countries have very limited research capacity, especially in the area of stock assessment, this situation is regarded as being unsatisfactory.

As a consequence, the status of tuna and tuna-like stocks in the Indian Ocean and the extent of fisheries interactions are highly uncertain. In a short term, this situation can be overcome by substantially increasing the research capacity of IPTP and its successor.

In a longer term, the needs for acquisition of information, its analysis and dissemination require a much broader spectrum of research and analytical skills. Such skills include not only more fisheries scientists (especially population dynamicists) but also what is now completely lacking, social scientists with background and training relevant to a fishery body that seeks the management objectives recommended here.

In addition to the work of IPTP, the Indian Ocean Commission also conducts research on tuna through its Regional Tuna Project. This was described in the

Report of the 10th Session of the IOFC Committee on the Management of Tuna (IOFC 1988):

> This programme had as members Comoros, France (the Department of Reunion), Madagascar and Mauritius, Seychelles having observor status and participating in the scientific programme. The three main objectives were:
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> - resource evaluation, including compilation and exchange of statistics, biological studies and tagging;
>
> - assistance in fisheries development, comprising prospection, test fishing, FADs, live-bait fishing and holding;
>
> - training of specialist fishermen ashore and on board the project vessel.
>
> The Committee was assured that data from this programme would be forwarded to IPTP.
>
> The above programme is executed by the Association thonière. An observor from the Association stated that work was conducted in national support centres. The centre in Comoros was at Anjouan, and concentrated on training and FAD deployment. The centre at Nosy Be, Madagascar, conducted test fishing and improved methods of holding baitfish for pole-and-line fishing. Data collection and analysis, as well as biological studies were conducted from Albion, Mauritius, while environmental studies, including satellite remote sensing, were based in Reunion. The Programme operated a chartered seiner having bait fish carrying capacity...and conduct of the scientific programme had been sub-contracted to the French Institute of Scientific research for Cooperative Development (ORSTOM).

Other alternatives for carrying out the information function would include the creation of an international body for global tuna, with subpanels for dealing either with particular species (southern bluefin) or particular regions of the world. While collection of information would be decentralized (but also assisted by the global body where necessary), the global body would handle analysis and dissemination.

Although more adequate research inputs are needed for an Indian Ocean management body, improved benefits can be obtained based on existing knowledge of the fishery and its potential benefits. The evidence of current considerations of an Indian Ocean tuna body, both within FAO and outside, suggests that the states already believe that improved benefits are now obtainable.

3.2 - Regulations

To achieve optimum benefits from the utilization of tuna resources, several kinds of regulations need to be imposed. These may include regulations such as: (a) controls on catches (including limits on the total catches of target species, amounts of by-catch species and limits on the size of individual fish that are taken); (b) on the amount of fishing effort and fishing gear; (c) on the kind of fishing effort and gear; and (d) on the non-harvest activities such as processing; location of landings; facilities for provisioning; and quality controls.[12] Prior experience with regard to regulatory measures is discussed below followed by some remarks on the alternative approaches.

A clear distinction is to be made between the competence of a fishery body to recommend regulations and the competence to prescribe. The former competence means that the member states retain the ultimate authority over acceptance of the regulation. A fishery agency with competence to prescribe has the authority to promulgate regulations that are directly and immediately applicable to affected vessels. The flag state of such vessels cannot act to interfere with the implementation of such regulations.

3.2.1 - Prior experience

3.2.1.1 - Multilateral approaches:

There is very little prior direct experience with international fishery bodies regulating tuna exploitation or any other fish species. The IATTC recommended conservation regulations for the eastern tropical Pacific for the period 1966-78, but the regulations were mainly addressed to one fleet only, that of the United States which dominated the fishery in that region at that time. The major recommendation was a limit on the total catches of yellowfin tuna within the regulatory area, which was adopted by the United States. Provisions for sharing the stocks were then made by states negotiating directly, not under the auspices of the IATTC. The regulatory system collapsed after 1977 because of withdrawals from the IATTC and no system has been selected as a replacement (Joseph 1990).

The only prior experiences with fishery bodies having regulatory functions are in the International Pacific Salmon Commission and the Mixed Commission for Black Sea Fisheries. The Salmon Commission has regulatory competence to

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[12] Much of the following material is based on a paper prepared by one of the authors for the South Pacific Forum Fisheries Agency (Christy 1985).

direct the salmon fishery on a day to day basis, since effective management requires the capacity to open or close the fishery on a real-time daily basis. The Mixed Commission has authority to decide on the species and dimensions of fish that may be caught.

In all other instances, the only authority accorded international fishery agencies has been to make recommendations. Since 1970, this arrangement has been modified in some instances from the traditional provision requiring that each member positively accept a given recommendation before it can be effective, to provision that it becomes effective within a specified time period unless it is objected to by a specified number of states. Eliminating a passive veto improves the possibility of adopting more effective management measures.

However, it must be pointed out that the regulatory competence of an international fisheries body does not necessarily lead to effective fisheries management. In fact, only two international fisheries bodies have achieved increases in net benefits to their members: the North Pacific Fur Seal Commission (see below) and the South Pacific Forum Fisheries Agency which, although it has no regulatory competence, has facilitated cooperation among its members leading to the extraction of higher fees from foreign fishermen and reduced costs of enforcement.

3.2.1.2 - Unilateral approaches:

Other possible approaches include regulations by coastal states that apply to tuna fishing within the EEZ as well as beyond, based upon provisions of the 1982 Convention on the Law of Sea and on customary law, as noted briefly above in the section on Assessment of Issues. Article 116 of the 1982 Convention, which derives from the 1958 Convention on Fishing and Conservation of the Living Resources of the High Seas (mentioned below in more detail), provides that "All states have the right for their nationals to engage in fishing on the high seas subject to: (a) their treaty obligations; (b) the rights and duties as well as the interests of coastal states provided for, inter alia, in article 63, paragraph 2, and articles 64 to 67; and (c) the provisions of this section."

The provision that high seas fishing rights are subject to coastal state rights is an entirely new provision in the international law of the sea. Article 1 of the 1958 Conservation Convention also states that high seas fishing rights are subject to coastal state rights and interests, but in that context the coastal state did not have sovereign rights over fisheries outside its national territory. Article 116 might be interpreted to provide a basis for a coastal state to protect its interests in tuna within its zone of national jurisdiction by extending conservation and allocation measures to fishing activity on the high seas which impacts on tuna also caught within its EEZ. Thus far, coastal states have not sought to rely on article

116, in relation to article 64 and other articles on coastal state sovereign rights, to protect their tuna interests, but this might be a possible approach. This same approach is now being considered in the context of the closely related matters of straddling stocks and the use of driftnet gear on the high seas (Burke; Miles and Burke).

The 1982 Convention on the law of the sea is not the first attempt at a general international agreement providing for coastal state jurisdiction over adjacent ocean fisheries. The first United Nations Conference on the Law of the Sea in 1958 adopted the Convention on Fishing and Conservation of the Living Resources of the High Seas which permits coastal states under very limited conditions unilaterally to prescribe conservation measures for stocks adjacent to its territorial sea. The unilateral authority applies only after negotiations with other states concerned fail to produce agreement on conservation measures, for which there is a need for urgent application based on existing knowledge of the fishery. The conservation measures are to be based on scientific findings and must not discriminate in form or in fact against foreign fishermen. In the event a state party to the Convention does not accept the unilateral measures, any state party may invoke a compulsory dispute settlement procedure in the treaty. The measures remain in force pending a decision under this procedure. This agreement is in force between some major fishing states, but has never been used. The severity of the conditions for unilateral measures, especially their limited nature, discourages resort to this mechanism despite the availability of the dispute settlement procedure

3.2.2 - Controls on catch

3.2.2.1 - Alternative measures

Total quotas on catches have been adopted by several multinational fishery bodies for various purposes. Within the Indian Ocean such measures (combined with others) are presently in effect for southern bluefin tuna under an agreement by Japan, Australia and New Zealand. Such measures do not presently exist for other Indian Ocean tunas, although the Expert Consultation apparently considered some forms of catch controls for albacore and bigeye (IOFC 1990).

In addition to limiting the total catches of the target species, management bodies have sometimes adopted controls on the by-catch (species that are taken incidentally in the catching process). Certain gears, such as modern drift nets, are non-selective in nature and capture large numbers of other species in addition to the target species (Report of the Expert Consultation on driftnets). Also, in some fisheries using purse seines, the nets are set around indicator species, such as porpoise, which may be trapped in the nets.

Controls on the size of animals caught are often employed in order to achieve higher economic returns, particularly for species where there are significant price differences. Although catches of southern bluefin tuna are not subject to direct size controls, the management measures adopted by Australia (individual transferable quotas) have made it possible for the Australian fishermen to target on the larger sized animals.

This is a matter of increasing importance because the current developments in fishing gear and techniques tend to lead to larger catches of smaller animals. The Expert Consultation reported that purse seines take smaller animals than pole-and-line vessels; surface gears (purse seines, drift nets) take smaller bigeye, albacore and bluefin tunas than longlines; and fishing on debris takes smaller yellowfin tunas than fishing on free schools (IOFC 1990).

Where there are significant differences in prices between large and small sized animals, the total revenues from the fisheries under regulations that restrict the harvest of smaller animals will be considerably larger than those which allow such harvest. In the absence of such regulations, the tendencies to intercept the stocks at earlier stages and smaller sizes will continue, with a loss in total revenues and a decrease in the amount of economic rents that could be produced.

3.2.2.2 - Considerations

Several factors need to be weighed in the adoption and implementation of the various kinds of catch controls. These include: the objectives of controls on total catches; the consequences of the controls; the choice of levels of total allowable catches; and the costs (in information and enforcement) associated with the imposition of the controls.

The major objective for attempts to control total catch is to prevent stock depletion or, where a stock has already been depleted, to allow for its rehabilitation.[13] Controls on total catch of one species or stock may be imposed to achieve higher levels of yield in a related species or stock. Non-commercial objectives, such as the protection of mammals, may also lead to catch controls.

Regulations on total allowable catches, however, have highly adverse economic consequences if they are imposed without additional direct or indirect controls on fishing effort. A total quota, by itself, creates the incentive for individual fishermen

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[13] There are some instances in individual fisheries where the fishermen have agreed among themselves to limit their total catch in order to maintain high prices in their markets. Such controls are only possible where the fishermen have the ability to prevent new entry.

to increase their own effort (by using larger or more vessels) in order to maximize their own catches before the total quota is reached and the season closes. For example, in the eastern tropical Pacific a total quota on the catch of yellowfin tuna was in effect from 1966 to 1979, during which the allowable catch was doubled. However, over the same period the total capacity of the international fleet increased four-fold, leading to a decline of over 50% in catch per ton of vessel capacity. The vessels were able to continue to operate only because of rising prices for tuna during that period. The overcapacity stimulated by a total quota leads to rapid dissipation of economic rents.

A total catch limit when employed in conjunction with other regulations, however, may be desirable. In the southern bluefin tuna fishery, for example, the total limits have been divided into national limits and, at least in the case of Australia, the national limits have been divided into individual vessel limits (known as Individual Transferable Quotas or ITQ's). This system provides an incentive for rationalization of the industry in that individual quota holders are stimulated to reduce the costs associated with the harvesting of their shares.

A possible arrangement would be one that determines the annual total allowable catches for the species, divides the totals into shares of economically appropriate sizes and then auctions off the shares to the highest bidders.

Any system making use of total allowable catches requires the determination of the appropriate levels of both catch and effort. This is a difficult task for various reasons. The need to determine the level that would most appropriately match the objective of maximizing net benefits requires economic analyses as well as biological ones. Different opportunity costs of different fleets and within different coastal states will complicate the analyses. There may also be complex interactions among stocks and between tuna stocks and other species of importance. There may, thus, be relatively high information costs depending upon the degree of precision desired for implementation of the arrangement.

Regulations based on catch levels also tend to have high enforcement costs because of the necessity for monitoring the amounts of fish taken. These costs may be high where there are large numbers of vessels and landing areas or extensive areas to be monitored.

3.2.3 - Limits on amount of fishing effort

3.2.3.1 - Alternative Measures

The most fundamental requirement for the achievement of economic benefits is that of providing some form of control over the amount of fishing effort (capital and labour) that can be used in the fishery. No such controls exist under the

condition of free and open access, which currently prevails in high seas areas and also within most national economic zones. In the absence of such controls, and where stocks are utilized beyond a certain point, economic rents are dissipated. This occurs when the level of fishing effort is such that the same amount of total catch (and total revenues) can be taken with smaller amounts of total fishing effort (and lower total costs). This is clearly the case with regard to the southern bluefin tuna and it is quite likely to be the case for the albacore fisheries in the Indian Ocean, although the available data are not sufficient to prove it. It is possible that such economic overfishing is already taking place for Indian Ocean yellowfin tuna. Unless appropriate management measures are implemented, economic waste in all Indian Ocean tuna fisheries is inevitable.

The waste in economic resources of capital and labour occurs at levels of fishing effort below those required to take the maximum yields. Thus, even though there may be opportunities to increase levels of catch, as is likely in the case of yellowfin tuna, the total costs of the additional effort may be greater than the additional revenues produced.

It is also important to note that the vulnerability of the stocks to harvest is critical in determining economically optimum levels of fishing effort, not the total stock itself. There are indications that skipjack tunas may only be subject to harvest at certain restricted times and places in the Indian Ocean so that biological overfishing may not be possible, with present gear. In this situation excessive amounts of capital and labour may be applied even though only a small portion of the total stock is being fished.

The issue of vulnerability may be affected by refinements in the ability to locate stocks (through satellite technologies or other means) and in techniques that aggregate schools of tuna. In the future, it is not unlikely that precise information on the location of concentrated schools can be provided to fishing fleets on a daily basis. This constitutes a major reduction in the searching costs, one of the highest cost elements in the fishing operation. The information may lead to congestion of fleets in particular areas and to the use of economically excessive amounts of fishing effort. Thus, the availability of new monitoring technology reinforces the need to control fishing effort.

Another significant element that may require regulation is that of the possible interaction between different fleets and fisheries. This may include interactions between different types of gear fishing the same stock at different periods of its life cycle; between fisheries for different but related species (eg. cephalopods as prey and tunas as predators); or, particularly, between the large scale industrial fleets and those of artisanal fishermen.

Different techniques for controlling effort can be used. The most direct is to limit the number of vessels or the amount of gear. Indirectly, the amount of effort

can be controlled by the use of economic disincentives; i.e., high taxes or license fees which make it uneconomical for some of the fishermen to continue operating. It is important to note that this approach reduces the total costs of fishing and permits the production and capture of economic rents, but it does not necessarily affect the economic returns and profitability of those who remain in the fishery since the payments they make will be balanced by the higher catches per unit of effort that they receive.

The Seychelles is currently collecting some economic rents from the distant water states, in the form of fees paid for the privilege of fishing within their zone. To the extent that these fees are paid by the vessel owners and not re-imbursed by their governments, directly or through subsidies, they operate as an economic disincentive and may serve to limit total effort. However, these payments are unlikely to represent the full rents available within the zone, much less those potentially available within the Indian Ocean as a whole.

A possible arrangement, similar to that mentioned above with regard to ITQ's, would be to set a total limit on the amount of fishing effort, divide that up into individual shares (eg., specific numbers of hooks in longlines or purse seine nets of certain dimensions) and auction off the shares to the highest bidders. Such a system would, however, have certain difficulties. The differences among states in economic parameters would make it extremely hard, if not impossible, to determine the economically optimum levels of fishing effort. Furthermore, the "seepage" effect, referred to below, would be difficult to control.

3.2.3.2 - Considerations

The major task to be addressed by an international regulatory regime is, thus, that of controlling the amount of fishing effort and preventing economic waste. There are various considerations related to the fulfillment of this task.

One of the problems associated with direct limits on fishing effort is that of preventing "seepage" around the controls. Individual fishermen will always seek to increase the catching power of their vessels. Thus, when any single element or input is controlled, they will substitute other inputs. Where a limit is place on the number of vessels, the fishermen will increase the size of their vessels. If the size is limited, they will install larger engines or use bigger nets. Since all fishermen will have the same incentive, the net result is frequently an increase in total effort.

This can be controlled by regulating all aspects of fish catching power or by reducing the number of allowed fishing units as individual units increase their effective catching power. However, the former approach tends to freeze technology and prevent innovations that may be economically desirable. The latter

approach is often difficult to implement because of vested interests in fishing, although it can be accomplished by some mechanism under which the excess units of effort are bought out.

The individual transferable quota scheme, mentioned in the previous section, is designed to avoid the problems of "seepage". Where a fisherman is guaranteed a right to take a certain quantity of fish, he should be permitted to do so with any method he wishes, provided it is not environmentally harmful or does not inflict undue damages to other fisheries. His incentive will be to reduce the costs of his fishing in order to maximize his profits. Since all fishermen will have the same incentive, this will lead to a reduction in total costs.

The problems associated with the use of economic disincentives as a means for controlling effort depend upon whether the system uses license fees attached to fishing effort or imposes taxes on the amount of catch. With license fees, the problems are similar to those of a license limit scheme in the need to avoid the seepage effect. With taxes based on catch or revenues, the problems are similar to those of ITQ systems, since they require careful monitoring of catches.

The choice of technique also depends upon whether the system is to be applied to vessels from outside the region, to vessels from other states within the region or to the vessels of one of the coastal states. Ideally, the same techniques should be uniformly applied to all vessels no matter what flag they fly or where they fish. In practice, however, there may be political difficulties associated with a uniform system. For example, a coastal state may be unwilling to apply the same license fee to its own vessels that it applies to vessels from outside the region, or there may be pressures to provide preferential rights (eg., lower fees) to vessels from neighboring states. Such approaches may considerably reduce the stability of the regime. They will reduce the economic rents available for allocation among the member states and, since the costs of access to the resources will not be fully borne by the fishermen, they will serve as a stimulus to over-invest in the fishery. The latter consequence will also occur if foreign governments, rather than the fishing enterprises, pay all, or a major part, of the price of access (whether this is in the form of direct payments or the provision of aid or of in-kind benefits). Such artificial distortions of cost and revenue relationships should be avoided.

In addition to the above considerations, states should take into account the importance of viewing the fisheries as an economic enterprise similar to other natural resource industries where property rights are in effect. In these industries, the owners receive a rent for the use of the resources, either in the form of the sale price upon transfer or as payments from a user. It is not only entirely appropriate for the "owners" of the Indian Ocean tuna resources (however they are defined) to receive such a rent but also it is through the extraction of economic rents that the fisheries will be operated in an economically efficient manner.

Efficiency will be gained in two regards. First, the full extraction of rent from the fishing enterprises will prevent excessive applications of capital and labour and the economic losses that are associated with the open access condition. Second, and equally important, the rents that are extracted will be available to cover the costs of management. These costs include the acquisition of information, enforcement and the administration of the regime. They should be sufficient to establish an independent data collection and research body and pay for whatever enforcement activities are agreed by the member states to be appropriate for an agency to undertake. In addition, some of the rents collected could be used to compensate vessel owners (directly or indirectly) for appropriate adjustments to the regime. Particularly, where it is desirable to reduce the number of vessels, the funds could be used to buy out the excess.

In addition to efficiency, the extraction of economic rents provides a simple and flexible system for allocating the benefits of the management measures. As discussed below, after deducting the costs of management, the surplus revenues would be shared by the participating states.

A very rough calculation can be made of the amounts of revenues that might be available in Indian Ocean tuna fisheries. The current catch levels by the industrial fisheries are over 200,000 tons. If the average price per ton to the tuna fishermen is on the order of US $800 per ton, the gross revenue would be $160 million per year. In other tuna fisheries, coastal states have extracted fees equivalent to 5% of the gross revenue. If this were done for the industrial fisheries of the Indian Ocean, it would produce an annual income of $8 million.[14] The entire budget of a large international fishery agency (the IATTC) is much less than this (indicating that the surplus available for allocation among the participating states may be quite large).

It should be noted that the extraction of 5% of gross revenues is not based on estimates of economic rents that may be available in the different fisheries. It is, rather, the result of negotiations and is used here simply for purposes of illustration. Potential economic rents may make up considerably larger proportions of the gross revenues.

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[14] Under an agreement between the United States and island state members of the South Pacific Forum Fisheries Agency, the United States is making annual payments of US $12 million for a period of five years. The costs of administering the agreement are deducted from the total and the balance is distributed among the states. Presumably the administration costs do not cover research and enforcement.

One of the major concerns of the developing coastal states with regard to the creation of an international tuna body is that of the costs. It should be clear, however, that if an effective management regime is put into place, the costs of the body would be covered by the additional economic rents produced.

3.2.4 - Controls on kinds of effort and gear

3.2.4.1 - Alternative measures

Controls on the kinds of vessels and gear are often adopted by national governments within EEZ's. Such controls include limits on the size of mesh in nets, prohibitions against destructive techniques (poisons and dynamite), limits on the size of vessels or amount of horsepower, etc. Some attempts to provide for such controls on the high seas have been made. In the Northwest Atlantic, ICNAF adopted mesh size regulations. The recent recommendation by the UN General Assembly for a moratorium on the use of drift nets on the high seas is another example.

The various controls on kinds of vessels and gear might be adopted for a variety of reasons, including: prevention of catches of juveniles or of smaller (and less valuable) individuals, reduction of by-catch, protection of the environment, prevention of "ghost fishing", etc. In some cases within national EEZ's, the controls have been adopted as a result of pressures to reduce competition by preventing new, and more efficient, techniques from being used.

3.2.4.2 - Considerations

In examining the desirability of adopting controls on the kinds of vessels and gear, consideration needs to be given to the objectives of the controls, the distributional consequences and the costs. An issue of growing significance is whether or not to limit or reverse the trends to harvest the stocks at earlier stages in their life cycles when the individuals are smaller in size and (generally) lower in price. With unrestrained competition under the present condition of free and open access, these trends are inevitable. With the ability to regulate the kinds of fishing effort, the states should undertake analyses to determine the desirability of establishing regulations on the kinds of gear and the methods of fishing that are allowed.

For example, the lower prices for the smaller animals may be balanced by the lower costs of harvest. Given the objective of maximizing net benefits, the choice should be made on the basis of the net revenues that accrue to the different gears and the potential economic rents that can be extracted, in addition

to the other effects associated with the use of the gear (e.g., incidental catches of other species or interactions between different user groups).

Interactions between different user groups also need to be considered in dealing with the question as to whether or not to adopt regulations on kinds of gear or fishing methods. The interactions may be between different gears catching the same stock at similar size levels or at different size levels; gears taking interrelated stocks; gears used by industrial fisheries and those used by artisanal fisheries; and gears used within different zones. Decisions on such interactions may be necessary to avoid conflicts.

As in the case of other controls, the adoption of gear regulations has important implications for the costs of acquiring information and of achieving effective enforcement.

3.2.5 - Regulations on non-harvest sector

The backward and forward linkages of the harvesting operations also produce important benefits for the Indian Ocean States. These may include, among others: provisioning of vessels; the use of ports for repairs, offloading, etc.; and processing of the catches. To a large extent, there are advantages to the distant-water vessels in using local ports and facilities for these services, primarily because of the distances from their home ports. However, local services do not necessarily have to be used since factory, servicing and transport vessels can fulfill many of the same functions.

Where distant-water fishing is conducted within the EEZ's of coastal states, the coastal states can require the use of local ports as part of the agreement. However, the coastal states may wish to consider joint approaches to the setting of requirements for the use of local ports. This would be desirable to avoid damaging competition.

For example, if several individual states developed their own canneries, the total capacity may be greater than the potential supply of raw materials and could lead to inefficient use. Similar results might occur if too many individual states construct port facilities for the servicing of foreign tuna vessels.

Under a joint approach, the coastal states might arrange that particular facilities be established in the state with the greatest comparative advantage and that a portion of the benefits derived from the facility be shared with the other states. This form of compensatory mechanism would allow the maximization of net revenues and allow compensation so that all states would be better off than under a system of unrestrained competition.

3.3 - Enforcement activities

(a) Activities within EEZs

Enforcement includes surveillance, monitoring, inspections, observation (observer programs), apprehension (arrest), trial and punishment (level of penalties), reporting of enforcement measures; post-penalty phase remedies (appeals). How these functions are implemented is important for the credibility of an overall management scheme, hence knowledge of national practices can be significant for overall compliance with regulations.

(b) Activities beyond national jurisdiction: enforcement steps are the same beyond as within the EEZ.

3.3.1 - Prior Experience

No international fishery body concerned with tuna has been delegated any enforcement authority over high seas fishing for tuna or for any other species nor have any of the other fishery bodies had direct enforcement competence. The common enforcement scheme on the international level has been to allow for arrests of suspected violators by the authorized enforcement vessels of any party, but to restrict the judicial/penalty phase to the action of the flag state.

Coastal states have undertaken enforcement actions within areas subject to national jurisdiction, including the arrest or seizure of fishing vessels and cargoes and arrest of crews aboard vessels apprehended in the EEZ or other national zone. National legislation in the Indian Ocean region includes provisions for reporting of position and catches, requirements for port visits for inspections, transhipment requirements, requirements of stowage of gear outside authorized fishing areas, observers, position-fixing equipment, and for bonds.

The most advanced enforcement functions for tuna harvesting are those developed by the South Pacific Forum Fisheries Agency for general application in that region and for specific implementation by the FFA states in their access agreement with the United States. However, no reference is made to these enforcement elements in the document entitled "Existing Arrangements for the Management of Tuna" prepared for the Indian Ocean Conference for the Adoption of a Draft Agreement for the Establishment of the Indian Ocean Tuna Commission.

The two essential elements of enforcement are the collection and collation of information about fishing activities in the region and, on this basis, the inducement of compliance by vessel operators with desired modes of conduct.

The economic efficiency of the enforcement system depends upon how it is designed, what types of information are sought, in what form, how the information is collated, and the means by which compliance is induced.[15]

In the South Pacific, instead of depending upon physical inspection at sea for collection of information, primary reliance has been placed upon self-reporting, which is in turn verified by information from a variety of sources collated regionally as well as nationally. Self-reporting here means radio and telex reporting by vessels on entry and departure from zones coupled with periodic position and catch reports. Catch/effort data are secured from logbooks maintained on a daily basis and forwarded to a regional center at the end of a vessel trip.

Verification of this information is partly through aerial surveillance at regional and national levels and through comparison with data on fleet landings collected from major landing ports within and outside the region. "Information is collated, in part, through the regional register of fishing vessels [see below for further description of this mechanism] which is the nexus of information for fishing vessels operating in the region, their characteristics and catch potential, historical catches and fishing areas" (Moore, at 163).

This information collection and collation system is made possible to a large extent by the design of access agreements and the embryonic management system. These are based on single effort parameters, such as vessel numbers and size, rather than by allowable catch and quotas. Access fees are expressed in terms of effort or catching potential rather than actual catch, thus reducing pressure on information gathering and verification process. Actual catch is not used so there is no need to count this. Likewise, there are no regulations on minimum size, so this need not be observed either.

The South Pacific enforcement system does not rely on physical inspection and enforcement by surface craft, which would be very difficult and costly because of the enormous water areas involved. This has meant increased reliance on air surveillance to detect possible violators, followed by nonphysical methods of ensuring that an offender submits voluntarily to the jurisdiction of local courts. The debates about this approach mentioned port state enforcement, long-arm jurisdiction procedures and joint extradition agreements. In the end the most effective methods have been the threat of blacklisting on the regional register of vessels and assignment to flag states of responsibility for compliance control.

The regional register of fishing vessels in the South Pacific Region is considered to be an effective deterrent to illegal fishing. The register provides

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[15] This section is based on Moore (1987) pp. 162-63.

information about the vessels in good standing to fish in the region; good standing refers to their record of compliance with conditions and requirements applicable in the various zones of national jurisdiction of the FFA states or in relevant agreements, such as that with the United States, which include areas outside national jurisdiction.[16] These terms and conditions have been mostly harmonized amongst the member states, including uniform vessel marking, reporting on entry and exit of zones, periodic position and catch reports, standard regional tuna catch/effort log sheets, placement of observers, standard stowage of gear requirements for unlicensed vessels in transit of a zone, and standard provisions on flag state responsibility for compliance control for future access agreements.

Regional cooperation in surveillance and enforcement is also enhanced by uniform boarding procedures, sharing information on illegal fishing, reciprocal enforcement of fishing laws, techniques for securing jurisdiction over fugitive vessels, and collection of landing data for vessels fishing in the region.

The regional register provides for dropping vessels from good standing upon complaint by a member state in two instances: (1) when the foreign vessel is convicted of a serious offense under the fisheries laws of a member state and has not complied with the resulting adverse judgment, and (2) where there is a *prima facie* case of a serious offense against a fishery law and the offender has not submitted to the jurisdiction of the relevant state. Provision is made for verification of the basis of a complaint and for ultimate restoration of a vessel to good standing upon satisfaction of a judgment or other removal of the basis for a complaint.

The regional register device appears to be a successful measure. It has only been tested in one instance so far and it is limited to a system which imposes controls only over the single element of vessel numbers. The use of a regional register with regard to controls over other elements, such as quantities of catch,

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[16] For an indication of such compliance measures, see Article 4 of the Treaty between Certain Pacific Island States and the United States, which provides for detailed measures to be taken by the United States to assist in enforcing the agreement. These include, *inter alia*, assistance in investigations of alleged violations and in facilitating: (i) claims against U.S. fishing vessels; (ii) service of process by a national or government of a Pacific Island nation against a U.S. flag vessel; (iii) prompt and full adjudication of claims under the Treaty; (iv) prompt and full satisfaction of final judgments or other determinations, and (v) financial assurances when collection of a civil or criminal judgment becomes a serious enforcement problem. Among other provisions, the United States promised to ensure departure from the Licensing Area of a U.S. flag vessel when there was probable cause to believe that the vessel committed specified violations of treaty provisions.

would require more thorough inspection procedures. But given the high costs of such procedures, the present approach appears to be economically efficient. As more experience is gained and as access fees increase, the register can be elaborated to cover more enforcement elements. Eventually, the linking of various regional registers would enhance enforcement capabilities of coastal states in the different tuna producing regions.

3.4 - Allocation

3.4.1 - Prior experience

There have been very few prior international fishery bodies with any competence to act to allocate benefits from fishing on stocks dealt with by the body. Two instances come to mind where the constitutive document for the fishery body provides for allocation. The best known instance was the International North Pacific Fur Seal Convention which allocated the benefits of fur seal exploitation among four states. The principal basis for the allocation in this instance was the fact that exploitation could be most efficiently prosecuted on the land rookeries where the seals were resident for part of their life cycle, whereas harvesting seals on the high seas was costly, wasteful (seals injured by not captured) and harmful to continued reproduction by the stock (taking of females). Accordingly the bulk of the benefits were allocated to the states on whose territory the rookeries were located, while the states who refrained from high seas harvests were compensated by a share of the proceeds of the land harvest. This arrangement continued for many years and has only recently been terminated for extraneous reasons.

A second instance of express allocation by agreement was that between the United States and Canada for sharing the salmon fishery of the Fraser River in Canada. The parties in this instance agreed to a 50-50 split of the allowable harvest. This arrangement has recently (1985) been replaced by a complex agreement affecting all transboundary salmon stocks harvested by these two states. This agreement seeks to provide each state with benefits equivalent to the production from its rivers.

A third illustration of allocation through a fishery body is the International North Pacific Fishery Convention where the Japanese agreed to abstain from fishing for salmon in the eastern North Pacific in accordance with the principles that the fish were being exploited at the maximum rate, were the subject of continuing study and were subject to regulation by the state of origin.

In the northwest Pacific Ocean the Soviet Union and Japan have for many years negotiated the allowable high seas catch of salmon by Japan (but not the catch by the Soviet Union in its own waters). In some years, these negotiations

have taken more than 200 days to conclude, indicating high transaction costs. In the past several years, the allowable Japanese catch has been declining and has required the payment of fees by Japan to the Soviet Union. There are current indications that this fishery may be terminated.[17]

There are other previous instances in which allocation decisions were made through negotiations within the context of a fishery body. The parties to the International Convention for the Northwest Atlantic Fisheries made provision for specific quotas for particular species. In the eastern tropical Pacific tuna fishery, the parties to the IATTC adopted an overall tuna quota for the convention area but made no provision for sharing of this overall catch. The allocation of this overall quota was effected by the states party to the IATTC by meetings between the states concerned outside the regime of the IATTC.

In the case of the tuna fishery for the eastern tropical Pacific, efforts to negotiate a treaty regime that would provide for allocations between coastal and noncoastal fishermen were made in the late 1970's, but were unsuccessful and this fishery is now unregulated. There is now no regulatory regime for harvests in this region.

The parties to the International Whaling Convention agreed among themselves to divide up the total allowable catch in the form of fleet quotas. The quotas were attached to the vessels and could be transferred by sale of the vessels, as was done by the UK vessel owners. This is, perhaps, the earliest example of the use of transferable quotas.

3.4.2 - Participants in the allocation of wealth

A fundamental issue is that of determining who shares in the net benefits produced from the fisheries. There are several possible alternatives and variants that might be considered. For purposes of illustration it is assumed in the following remarks that the wealth is defined as the economic rents that could be produced. As noted in the next section, the net benefits may be defined in other terms than economic rents.

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[17] The Soviet Union has publicly declared that the Japanese high seas fishery for salmon of Soviet origin should be terminated. The Soviet Union and the United States have drafted an agreement concerning salmon fishing in the North Pacific which provides that there shall be no high seas salmon fishing unless they agree otherwise. This draft agreement has not been published. Copy in the files of the authors.

a. Present system:

Under the present system, some portion of economic rents accrue to coastal states in the form of fees paid by distant-water fishermen for access rights. Coastal states without access agreements or those whose waters are not fished by foreign fishermen receive no benefits. Landlocked and geographically disadvantaged states also do not share in the benefits. Under this system, no economic rents are extracted from fishing on the high seas. To the extent that economic rents are produced, they accrue to the high seas fishermen.

b. Systems for sharing only within EEZ's:

Under agreement, the coastal states can agree to explicit systems for sharing net benefits from the tuna fisheries within their zones but make no attempt to extract rents from fishing on the high seas. One element would be a harmonization of regimes so that the coastal states could avoid competing with each other in the sale of access rights. The experience of the South Pacific Forum Fisheries Agency in this regard may be valuable, although there are considerable differences in the situations which would have to be taken into account. Harmonization would lead to an increase in the amount of benefits extracted from the foreigners but would not necessarily affect sharing systems, if the basis for sharing is the location of catch.

Harmonization of fees does not necessarily mean uniformity of fees. The value of fishing privileges for any particular stock may be different in different zones, due to differences in vulnerability, weather conditions, etc. If the fees are equal for all zones, there would be an imbalance in fishing effort since it would concentrate in zones where catching costs are lowest. Thus, the states may wish to base harmonized fees on values of fishing within the different zones. This approach would maximize the rents from the foreign fishermen but may require that those states which receive the largest revenues provide some compensatory payments to the other states.

Other variants would include a sharing of rents with neighbouring landlocked or geographically disadvantaged states or the provision of preferential rights (lower access fees) to vessels from developing countries of the region. The latter approach, as discussed in the next section, would have a destabilizing effect.

c. Systems for sharing high seas wealth:

As noted above, if the condition of free and open access remains on the high seas area of the Indian Ocean, all economic rents within that area will eventually be dissipated, even if there are conservation controls that are effective in preventing depletion. Conversely, the use of access controls on the high seas will inevitably lead to the production of economic rents (the amount depending upon

the effectiveness of the controls). Unless there is a system for extracting the rents, they will accrue to the fishermen who have the fishing privileges, resulting in a system under which the distant-water states (and any regional states whose vessels fish in the high seas) acquire the wealth.

Alternatively, the economic rents could be extracted from the high seas fishermen (through license fees or taxes) and shared among the coastal (or regional) states.[18]

d. Systems for sharing both within and outside EEZ's.

One alternative to allocation might be a claim by Indian Ocean coastal (or regional) states to authority over the living resources of the region, both inside and outside EEZs. Under this approach, the management agency (private or public) would extract economic rents from the tuna fisheries wherever they take place (perhaps excluding artisanal fisheries) and distribute the shares among all member states. The management agency would be able to extract the maximum economic rents from the fishing fleets, both regional and distant-water. It could deduct the costs of management (acquisition of information and enforcement) and then distribute the net proceeds.

The legal basis for a unilateral claim by Indian Ocean states to all the living resources of the Indian Ocean is insubstantial at best although, in other contexts, high seas fishing states have agreed to include high seas areas in arrangements tied to coastal state claims to fish in their EEZ's. (The primary illustration is the United States agreement with the Pacific island states.) Even more limited claims by coastal states to authority over adjacent straddling stocks are not unequivocally recognized in the 1982 Convention. However, earlier discussion noted that restrictions on freedom of fishing on straddling stocks might be derived by interpretation of various provisions of the 1982 Convention on the Law of the Sea, but no state has yet advanced such an interpretation.

3.4.3 - Determining the benefits to be shared

A basic task for states involved in the allocation of benefits from a shared fishery is that of defining the benefits. Several different definitions are possible. Criteria for evaluation of the alternative approaches include simplicity of operation, flexibility to allow for changes in methods and fisheries and accountability to ensure that all participants are fully aware of the amount of benefits shared.

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[18] If those who pay the fees (the high seas fishing vessels) were to receive shares in the rents they would be receiving surplus profits which, depending upon the system of control, would attract additional wasteful capital.

Simplicity is important because there are different views among states of the region with regard to the benefits sought from the resources. The benefits may be viewed as a source of revenue to be extracted from foreign fishing; as contributions to the economy from foreign use of ports and processing facilities; as a basis for the development of a domestic industrial fleet; or as an important source of employment and earnings for domestic artisanal fishermen. These different kinds of values mean that there is no common denominator by which the net benefits from the fisheries as a whole can be measured.

Flexibility is important because the benefits should be defined in such a way as to provide individual states with a choice as to how they wish to use the resources they share. Accountability is necessary to ensure that all participants abide by the arrangements. If one member perceives, rightly or wrongly, that other states are not in compliance with the system, then it loses the incentive to continue to respect the agreement.

There are three possible approaches to the definition of benefits: (a) monetary (net economic revenues); (b) resource (shares in the allowable yields of the stocks); and (c) effort (shares in allowable fishing effort or capacity). The following discussion refers to benefits both within and outside of national EEZ's.

a. Monetary benefits:[19]

Defining benefits in monetary terms is conceptually the easiest to describe and implement. Under this approach, the states would agree that the management objective would be to maximize the net economic revenues from the fisheries. This could be achieved by auctioning the rights to fish (either by license or fisherman quota) to the highest bidders. The costs of administering the system (including those of research and enforcement) would be deducted and the net proceeds divided up among the member states. The allocation (or distribution) of net proceeds would be based on whatever criteria the member states choose (see below).

A considerable advantage to this approach is that it would meet the criterion of simplicity by using money as the common denominator.

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[19] Monetary benefits should properly include both the rents available from the provision of fishing privileges and the contributions to national economies derived from the servicing of vessels, processing of products, etc. These latter benefits should be calculated in economic terms so that all participants can have a common understanding of the total benefits that are being shared.This section, however, refers only to the monetary returns associated with the fishing privileges.

It would meet the criterion of flexibility, provided that all member states agreed that all fishermen, whether regional or distant-water, would be required to pay the same fees. If, however, this is not agreed, and fishermen of the regional states were to receive preferential treatment in the form of lower fees, the system will become unstable. Such preferential treatment would provide larger benefits to the states investing in fishing capacity than to those who do not. It would reduce total revenues and, thereby, the shares available for distribution. This would create the incentive for greater investments by member states or for the acquisition of vessels (perhaps through charter or other arrangements) in order to acquire the preference. Such pressures would create instability in the system and lead to its breakdown.

Meeting the criterion of accountability would depend upon the means used for extracting the revenues. If license fees are used, there must be assurance that all vessels fishing for tuna in the region are licensed and are paying the required fee. If artisanal vessels are exempted from this requirement, there must be assurance that such vessels fully meet the agreed definition of an artisanal vessel. If the system uses a tax on catch to extract revenues, the catches by both regional and distant-water states must be closely monitored. The latter approach, although theoretically preferable, would generally be more difficult and costly to control.

b. Resource benefits:

The second approach is to base allocation on shares of the yields from the stocks. The technique of national quotas has been used in several multinational fisheries. Agreement is reached on the total allowable catch (TAC) for the relevant species (sometimes broken down by sub-regions) and the TAC is then divided up among the participating states.

This is a relatively simple technique using fish as the common denominator. It is not, however, as simple as the monetary approach since a particular stock of fish often has different values in different areas and at different seasons. It may, for example, be less costly to fish a stock of skipjack in one region than in another because of conditions that affect schooling patterns or the accessibility at the surface. There are also differences in sizes of individuals during migratory movements.

A more difficult problem with the national quota approach is that of meeting the criterion of flexibility, In regions such as the Northeast Atlantic, where national quotas are used, the fishing capacities of the sharing states are sufficient to harvest the shares allocated to them. In the Indian Ocean, an allocation of national quotas to the regional states would have little meaning if it is assumed that they are to be taken by the states themselves.

This difficulty could be avoided by making the quotas transferable. An individual member state, which has a national quota, would be free to take whatever amount it wants with its own vessels and let foreign vessels (regional or distant-water) have access to the balance on the basis of an agreed price. As in the case of the monetary system, preferential treatment given to member states would tend to make the system unstable.

Accountability would also be a difficult criterion to meet. The experience with national quotas in other regions of the world is not auspicious. There is considerable evidence that reported catches are below actual catches and that the vessels of some states taken catches greater than their nation's allocated shares. This does not necessarily preclude the use of this approach, but it does mean that verification of reported catches is an essential task.

c. Effort shares:

Finally, it is conceivable that the allocation could be based on fishing effort. In this approach an estimate would be made of the total allowable effort (eg., total number of hooks in a longline fishery; total size of nets in a purse seine fishery; total investment in fishing capacity; etc.). The total allowable effort would then be divided among the participating states and made transferable, as in the case of national catch quotas.

This would be a difficult approach, in view of the complexity of determining appropriate units of effort and the total amount. But it may have advantages in that it may be less costly to monitor and enforce.

3.4.4 - Determining how costs are to be shared

Since the objective is to maximize the net benefits from the arrangement, the costs associated with the implementation of the management regime, and the ways in which the costs are to be shared, must also be considered. These costs are mainly those related to the acquisition of information (collection of data and conduct of research) and the enforcement of the regime.

With a single management agency covering the Indian Ocean as a whole, it would be fairly easy to deal with the problems since costs would be incurred largely by the agency in the fulfillment of its functions. They could then be deducted from the total revenues received by the agency and the net revenues distributed.

At the other extreme, which is the present situation, enforcement applies only to the areas within national EEZ's and is the responsibility of the coastal states. Data acquisition is being undertaken by the Indo-Pacific Tuna Development and

Management Programme (IPTP) whose costs were largely borne by outside support (Japan and the UNDP) until the end of 1989. Currently, $300,000 is contributed by Japan and $200,000 comes from the participating countries, including the distant-water states. Only a limited amount of research is being undertaken.

Between these two extremes, there are numerous alternative approaches. With regard to information costs, these might include a regional data acquisition and research agency funded by coastal states and/or distant water states or a coordinating body which undertakes no research itself but relies on research undertaken by member states. With regard to enforcement, the alternatives would depend upon the element of enforcement to be covered. For the monitoring function, a regional body funded by coastal states, might provide for the creation and maintenance of a regional register of tuna fishing vessels, as is done by the South Pacific Forum Fisheries Agency. The function of apprehending or reporting violators might be covered by individual coastal states for infringements within their zones. On the high seas, compliance might be the responsibility of flag states, employing their own resources forces, as was done by the United States in the IATTC, or be taken on by a separate body funded by coastal states.

Although it is not possible to describe the variants in detail in this paper, it is important that the cost elements be fully considered in the process of establishing a regime.

3.4.5 - Criteria for allocation

The range of potential criteria for allocation of net benefits is enormous, although few have actually been used in practice since this objective is seldom employed by international bodies. Unless otherwise noted, the criteria mentioned hereafter may have been employed for allocation, without regard to the subject-matter being allocated.

3.4.5.1 - Prior Experience

At the international level, previous efforts at allocation of benefits include the International Pacific Salmon Commission (the United States and Canada agreed to share equally in the benefits, although Canada assumed a disproportionate share of the costs), the Fur Seal Convention (the shares were distributed in accordance with the location of the resource, with a lesser share going to the states who refrained from use of the resource on the high seas), and the Pacific island nations (sharing of payments and fees from the United States is by agreement among the recipient states). A potential allocation system is that of the Eastern Tropical Pacific coastal states who by recent agreement appear to permit coastal states to retain control over access to tuna within the EEZ (and

perhaps even beyond to some undetermined extent -- the terms of this agreement are ambiguous), while issuing licenses for fishing on the high seas out to 145 degrees west. Fees from these licenses may be used to fund the Eastern Tropical Pacific Tuna Fishing Organization. There is no mention of a surplus from these fees and therefore no provision for distribution.

Criteria for allocation include historic rights, recognizing and giving effect to the prior record of exploitation within a zone. In the Northwest Atlantic ocean, the International Commission for Northwest Atlantic Fisheries created total allowable catches for specific species. These species quotas were then allocated among the members in accordance with a formula which gave greatest emphasis to historic catch and lesser emphasis to the geographic position of a coastal state and to special considerations such as new entrants, developing state fisheries, and to non-members.

A variant of this system would construct the historic right on the basis of catches within areas of national jurisdiction, including archipelagic waters and the exclusive economic zone. This version of historic rights gives great weight to the geographic position of the coastal state as opposed to the emphasis on the historic right of the flag state under the ICNAF scheme. Adjacency in this approach is of the greatest importance.

Another form of adjacency is more extreme, providing that the entire ocean region (the whole Indian Ocean) be divided into sections delimited by extension of coastal and island states areas of jurisdiction. This is the national lake approach. Allocation in this scheme would provide for harvests to be shared in accordance with the proportion of the catch taken in the individual sections of the lake. The effect of this approach would be to allow each individual lake "owner" to determine the distribution of the catch allocated to its section of the lake.

Another version of this approach might be for the coastal states to assert a claim to all the resources of the Indian Ocean, both inside and outside the exclusive economic zone, and to allocate the benefits of the resource in accordance with the shares taken within the various national sections of the region. The accounting for the total harvest from the region would proceed internationally, while the allocation would be on the basis of national sectors. Thus the international management entity would provide for distribution of access to the stocks of the Indian Ocean, permitting control over total harvesting effort, while the benefits of this approach might be allocated by the national lake method.

Need might be recognized as an important factor for allocation. Shares of the catch or of the overall benefits produced would be distributed in accordance with indicators of need. Such indicators might be general, such as gross national product as a whole or more specific in nature, such as emphasis on proportion of

GNP from fishing or from marine use as a whole, or on per capita income, or per capital food needs (caloric requirements or protein needs).

Other factors related to fish might include size of overall fishing operations, including the extent of subsistence fisheries, artisanal fisheries, and processing operations.

More general factors affecting allocation could include the portion of the population engaging in marine activities, or the value of resources devoted to marine activities with special weight for the fishing sector. Other, more remote, factors could include the total population or the length of the coastline.

4. CONCLUSIONS

Although the above discussion is designedly speculative and theoretical, certain aspects have concrete significance for states in the process of formulating and establishing an Indian Ocean tuna body. The more important of these are identified below. It is recognized, of course, that the alignment of practical considerations and political forces will affect the structure of a new regime and that these may make it difficult to fully implement the ideas and suggestions. Nevertheless, it is worth stressing that previous attempts to create international fisheries bodies have generally failed to achieve effective management of fisheries and produce benefits for the member states. Past experience does not provide an appropriate model for future arrangements.

The most important single proposition advanced in this study is that the formulation and establishment of an international fisheries body (or bodies) for Indian Ocean tuna (and other species included in the organization's competence) must be built upon the objectives of achieving the maximum net benefits from the resources and providing for a stable system of allocation. The failure to adopt and implement these objectives is the major reason why international fisheries bodies, as a whole, have failed to achieve effective fisheries management. An Indian Ocean body which does not incorporate such objectives will not provide a level of benefits commensurate with the potential contribution from these resources.

It is considered essential that the Indian Ocean tuna body have an area of competence that includes all waters both within and outside of national EEZ's, with possible reservations for artisanal fisheries or localized species of tunas, i.e., other than the major market species. Maximum benefits cannot be produced if the fisheries in the EEZ's are not included. A strong regime for high seas fisheries alone would create incentives for the distant-water states to focus their effort within the zones of the coastal states that offer the best deals. The result would be destructive competition among the coastal states and a reduction of gross and net benefits. Separate regimes for the EEZ's and the high seas are undesirable.

4.1 - Acquisition of information

1. The objective of maximizing net benefits cannot be achieved without adequate information on the economic aspects of the fisheries as a whole and on the social characteristics of the artisanal fisheries. Such information is not presently being collected for the industrial tuna fisheries and only a limited amount of such information is available for national fisheries within economic zones. Without such information, it will be impossible for the states to make informed decisions on alternative arrangements for the regulation of tunas and the allocation of the benefits.

2. Prior experience indicates that it is highly desirable to have a single independent agency responsible for the collection of data and the conduct of research. This agency or its operations must be carefully insulated from enforcement efforts in order to avoid deterioration in the quality of the data collected.

3. Whether a new tuna organization is an article XIV FAO body or independent is a political judgment informed in part by considerations beyond the scope of this study. It deserves reiteration, however, that if the objective of maximizing production of net benefits is implemented successfully, this choice concerning organizational affiliation need not be influenced by funding needs for the organization or by fears of dominance by non-Indian Ocean states. There should be ample funds available from fishing fees to establish a skilled and independent agency capable of carrying out the necessary management functions.

4.2 - Regulation

1. The purpose of the regulations should be to extract the full economic rents from the fishing enterprises. If this is not done, there will be wasteful investments in capital and labour and a diminution of the net benefits available for distribution among the parties and for the operations of the management body.

2. The fact that some distant-water fishing states are willing to pay for access to the EEZ's of some Indian Ocean coastal states reflects the presence of a value in the privilege to fish for tuna in the area. The extraction of this (partial) rent is a function of management, as defined in this paper. Potential economic rents also exist, at present, on the high seas justifying, therefore, a need for the ocean-wide management of Indian Ocean tuna.

3. It is essential that regulations be adopted to control access to the tuna resources throughout the Indian Ocean. Regulations restricted solely to limits on total allowable catch must be avoided because of their incentives to over-invest. They may be desirable if combined appropriately with other measures.

4. Controls on effort in the tuna fisheries should apply equally to all industrial fisheries, by gear types, whether within or outside national economic zones.

5. There should be uniformity of fee structures for all industrial fisheries throughout the area of the regime. The fee structures might allow for differences in levels of fees in accord with differences in the value of fishing in different areas. However, it should not allow for differences between regional and non-regional fleets since this would destabilize the regime.

6. All the costs of management (including those for research, enforcement and administration) should be taken into account in the formulation of the regime and the adoption of regulations. These costs should be deducted from the economic rents that are collected before the rents are allocated among the eligible states. The scope and content of the regulations need to be carefully considered in light of enforcement costs which have the potential to reduce net benefits markedly. In particular, the various options for fee systems should be appraised with this factor in mind.

4.3 - Enforcement

1. Cost/effectiveness in the adoption of enforcement measures is essential. Since there are generally high costs associated with achieving effective enforcement at sea, measures need to be designed to minimize the need for this form of physical enforcement.

2. It is especially important to harmonize coastal state conditions affecting enforcement. Use of a regional register for foreign fishing vessels is likely to be especially useful, and will be magnified if linked with regional registers employed in other oceans. Experience elsewhere establishes that negotiations to achieve flag state compliance measures will be highly important in achieving an effective regime.

3. Since a regulatory regime for Indian Ocean tuna is presently needed to improve economic benefits, early consideration should be given to the creation of enforcement mechanisms.

4.4 - Allocation

1. The function of determining the amount of shares of net benefits to be allocated to participating states is essentially a matter of negotiation and should be kept separate from the function of achieving the maximum net benefits.

2. The net benefits produced by the regime should allocated in such a way that all states which are in a position to significantly affect the arrangements feel that they are better off by respecting the arrangements than by breaking them.

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ANNEX I

Excerpts from

UNITED NATIONS CONVENTION ON THE LAW OF THE SEA

PART V

EXCLUSIVE ECONOMIC ZONE

Article 56
Rights, jurisdiction and duties of the coastal State in the exclusive economic zone

1. In the exclusive economic zone, the coastal State has:

(a) sovereign rights for the purpose of exploring and exploiting, conserving and managing the natural resources, whether living or non-living, of the waters superjacent to the sea-bed and of the sea-bed and its subsoil, and with regard to other activities for the economic exploitation and exploration of the zone, such as the production of energy from the water, currents and winds;

(b) jurisdiction as provided for in the relevant provisions of this Convention with regard to:

(i) the establishment and use of artificial islands, installations and structures;

(ii) marine scientific research;

(iii) the protection and preservation of the marine environment;

(c) other rights and duties provided for in this Convention.

2. In exercising its rights and performing its duties under this Convention in the exclusive economic zone, the coastal State shall have due regard to the rights and duties of other States and shall act in a manner compatible with the provisions of this Convention.

3. The rights set out in this article with respect to the sea-bed and subsoil shall be exercised in accordance with Part VI.

Article 61
Conservation of the living resources

1. The coastal State shall determine the allowable catch of the living resources in its exclusive economic zone.

2. The coastal State, taking into account the best scientific evidence available to it, shall ensure through proper conservation and management measures that the maintenance of the living resources in the exclusive economic zone is not endangered by over-exploitation. As appropriate, the coastal State and competent international organizations, whether subregional, regional or global, shall co-operate to this end.

3. Such measures shall also be designed to maintain or restore populations of harvested species at levels which can produce the maximum sustainable yield, as qualified by relevant environmental and economic factors, including the economic needs of coastal fishing communities and the special requirements of developing States, and taking into account fishing patterns, the interdependence of stocks and any generally recommended international minimum standards, whether subregional, regional or global.

4. In taking such measures the coastal State shall take into consideration the effects on species associated with or dependent upon harvested species with a view to maintaining or restoring populations of such associated or dependent species above levels at which their reproduction may become seriously threatened.

5. Available scientific information, catch and fishing effort statistics, and other data relevant to the conservation of fish stocks shall be contributed and exchanged on a regular basis through competent international organizations, whether subregional, regional or global, where appropriate and with participation by all States concerned, including States whose nationals are allowed to fish in the exclusive economic zone.

Article 62
Utilization of the living resources

1. The coastal State shall promote the objective of optimum utilization of the living resources in the exclusive economic zone without prejudice to article 61.

2. The coastal State shall determine its capacity to harvest the living resources of the exclusive economic zone. Where the coastal State does not have the capacity to harvest the entire allowable catch, it shall, through agreements or other arrangements and pursuant to the terms, conditions, laws and regulations referred to in paragraph 4, give other States access to the surplus of the allowable catch, having particular regard to the provisions of articles 69 and 70, especially in relation to the developing States mentioned therein.

3. In giving access to other States to its exclusive economic zone under this article, the coastal State shall take into account all relevant factors, including, inter alia, the significance of the living resources of the area to the economy of the coastal State concerned and its other national interests, the provisions of articles 69 and 70, the requirements of developing States in the subregion or region in harvesting part of the surplus and the need to minimize economic dislocation in States whose nationals have habitually fished in the zone or which have made substantial efforts in research and identification of stocks.

4. Nationals of other States fishing in the exclusive economic zone shall comply with the conservation measures and with the other terms and conditions established in the laws and regulations of the coastal State. These laws and regulations shall be consistent with this Convention and may relate, inter alia, to the following:

(a) licensing of fishermen, fishing vessels and equipment, including payment of fees and other forms of remuneration, which, in the case of developing coastal States, may consist of adequate compensation in the field of financing, equipment and technology relating to the fishing industry;

(b) determining the species which may be caught, and fixing quotas of catch, whether in relation to particular stocks or groups of stocks or catch per vessel over a period of time or to the catch by nationals of any State during a specified period;

(c) regulating seasons and areas of fishing, the types, sizes and amount of gear, and the types, sizes and number of fishing vessels that may be used;

(d) fixing the age and size of fish and other species that may be caught;

(e) specifying information required of fishing vessels, including catch and effort statistics and vessel position reports;

(f) requiring, under the authorization and control of the coastal State, the conduct of specified fisheries research programmes and regulating the conduct of such research, including the sampling of catches, disposition of samples and reporting of associated scientific data;

(g) the placing of observers or trainees on board such vessels by the coastal State;

(h) the landing of all or any part of the catch by such vessels in the ports of the coastal State;

(i) terms and conditions relating to joint ventures or other co-operative arrangements;

(j) requirements for the training of personnel and the transfer of fisheries technology, including enhancement of the coastal State's capability of undertaking fisheries research;

(k) enforcement procedures.

5. Coastal States shall give due notice of conservation and management laws and regulations.

Article 64
Highly migratory species

1. The coastal State and other States whose nationals fish in the region for the highly migratory species listed in Annex I shall co-operate directly or through appropriate international organizations with a view to ensuring conservation and promoting the objective of optimum utilization of such species throughout the region, both within and beyond the exclusive economic zone. In regions for which no appropriate international organization exists, the coastal State and other States whose nationals harvest these species in the region shall co-operate to establish such an organization and participate in its work.

2. The provisions of paragraph 1 apply in addition to the other provisions of this Part.

PART VII

HIGH SEAS

SECTION 1. GENERAL PROVISIONS

Article 86
Application of the provisions of this Part

The provisions of this Part apply to all parts of the sea that are not included in the exclusive economic zone, in the territorial sea or in the internal waters of a State, or in the archipelagic waters of an archipelagic State. This article does not entail any abridgement of the freedoms enjoyed by all States in the exclusive economic zone in accordance with article 58.

Article 87
Freedom of the high seas

1. The high seas are open to all States, whether coastal or land-locked. Freedom of the high seas is exercised under the conditions laid down by this Convention and by other rules of international law. It comprises, inter alia, both for coastal and land-locked States:

(a) freedom of navigation;

(b) freedom of overflight;

(c) freedom to lay submarine cables and pipelines, subject to Part VI;

(d) freedom to construct artificial islands and other installations permitted under international law, subject to Part VI;

(e) freedom of fishing, subject to the conditions laid down in section 2;

(f) freedom of scientific research, subject to Parts VI and XIII.

2. These freedoms shall be exercised by all States with due regard for the interests of other States in their exercise of the freedom of the high seas, and also with due regard for the rights under this Convention with respect to activities in the Area.

Article 88
Reservation of the high seas for peaceful purposes

The high seas shall be reserved for peaceful purposes.

Article 89
Invalidity of claims of sovereignty over the high seas

No State may validly purport to subject any part of the high seas to its sovereignty.

Article 90
Right of navigation

Every State, whether coastal or land-locked, has the right to sail ships flying its flag on the high seas.

Article 91
Nationality of ships

1. Every State shall fix the conditions for the grant of its nationality to ships, for the registration of ships in its territory, and for the right to fly its flag. Ships have the nationality of the State whose flag they are entitled to fly. There must exist a genuine link between the State and the ship.

2. Every State shall issue to ships to which it has granted the right to fly its flag documents to that effect.

Article 92
Status of ships

1. Ships shall sail under the flag of one State only and, save in exceptional cases expressly provided for in international treaties or in this Convention, shall be subject to its exclusive jurisdiction on the high seas. A ship may not change its flag during a voyage or while in a port of call, save in the case of a real transfer of ownership or change of registry.

2. A ship which sails under the flags of two or more States, using them according to convenience, may not claim any of the nationalities in question with respect to any other State, and may be assimilated to a ship without nationality.

Article 93
Ships flying the flag of the United Nations, its specialized agencies and the International Atomic Energy Agency

The preceding articles do not prejudice the question of ships employed on the official service of the United Nations, its specialized agencies or the International Atomic Energy Agency, flying the flag of the organization.

Article 94
Duties of the flag State

1. Every State shall effectively exercise its jurisdiction and control in administrative, technical and social matters over ships flying its flag.

2. In particular every State shall:

(a) maintain a register of ships containing the names and particulars of ships flying its flag, except those which are excluded from generally accepted international regulations on account of their small size; and

(b) assume jurisdiction under its internal law over each ship flying its flag and its master, officers and crew in respect of administrative, technical and social matters concerning the ship.

3. Every State shall take such measures for ships flying its flag as are necessary to ensure safety at sea with regard, inter alia, to:

(a) the construction, equipment and seaworthiness of ships;

(b) the manning of ships, labour conditions and the training of crews, taking into account the applicable international instruments;

(c) the use of signals, the maintenance of communications and the prevention of collisions.

4. Such measures shall include those necessary to ensure:

(a) that each ship, before registration and thereafter at appropriate intervals, is surveyed by a qualified surveyor of ships, and has on board such charts, nautical publications and navigational equipment and instruments as are appropriate for the safe navigation of the ship;

(b) that each ship is in the charge of a master and officers who possess appropriate qualifications, in particular in seamanship, navigation, communications and marine engineering, and that the crew is appropriate in qualification and numbers for the type, size, machinery and equipment of the ship;

(c) that the master, officers and, to the extent appropriate, the crew are fully conversant with and required to observe the applicable international regulations concerning the safety of life at sea, the prevention of collisions, the prevention, reduction and control of marine pollution, and the maintenance of communications by radio.

5. In taking the measures called for in paragraphs 3 and 4 each State is required to conform to generally accepted international regulations, procedures and practices and to take any steps which may be necessary to secure their observance.

6. A State which has clear grounds to believe that proper jurisdiction and control with respect to a ship have not been exercised may report the facts to the flag State. Upon receiving such a report, the flag State shall investigate the matter and, if appropriate, take any action necessary to remedy the situation.

7. Each State shall cause an inquiry to be held by or before a suitably qualified person or persons into every marine casualty or incident of navigation on the high seas involving a ship flying its flag and causing loss of life or serious injury to nationals of another State or serious damage to ships or installations of another State or to the marine environment. The flag State and the other State shall co-operate in the conduct of any inquiry held by that other State into any such marine casualty or incident of navigation.

Article 95
Immunity of warships on the high seas

Warships on the high seas have complete immunity from the jurisdiction of any State other than the flag State.

Article 96
Immunity of ships used only on government non-commercial service

Ships owned or operated by a State and used only on government non-commercial service shall, on the high seas, have complete immunity from the jurisdiction of any State other than the flag State.

Article 97
Penal jurisdiction in matters of collision or any other incident of navigation

1. In the event of a collision or any other incident of navigation concerning a ship on the high seas, involving the penal or disciplinary responsibility of the master or of any other person in the service of the ship, no penal or disciplinary proceedings may be instituted against such person except before the judicial or administrative authorities either of the flag State or of the State of which such person is a national.

2. In disciplinary matters, the State which has issued a master's certificate or a certificate of competence or licence shall alone be competent, after due legal process, to pronounce the withdrawal of such certificates, even if the holder is not a national of the State which issued them.

3. No arrest or detention of the ship, even as a measure of investigation, shall be ordered by any authorities other than those of the flag State.

Article 98
Duty to render assistance

1. Every State shall require the master of a ship flying its flag, in so far as he can do so without serious danger to the ship, the crew or the passengers:

(a) to render assistance to any person found at sea in danger of being lost;

(b) to proceed with all possible speed to the rescue of persons in distress, if informed of their need of assistance, in so far as such action may reasonably be expected of him;

(c) after a collision, to render assistance to the other ship, its crew and its passengers and, where possible, to inform the other ship of the name of his own ship, its port of registry and the nearest port at which it will call.

2. Every coastal State shall promote the establishment, operation and maintenance of an adequate and effective search and rescue service regarding safety on and over the sea and, where circumstances so require, by way of mutual regional arrangements co-operate with neighbouring States for this purpose.

Article 99
Prohibition of the transport of slaves

Every State shall take effective measures to prevent and punish the transport of slaves in ships authorized to fly its flag and to prevent the unlawful use of its flag for that purpose. Any slave taking refuge on board any ship, whatever its flag, shall ipso facto be free.

Article 100
Duty to co-operate in the repression of piracy

All States shall co-operate to the fullest possible extent in the repression of piracy on the high seas or in any other place outside the jurisdiction of any State.

Article 101
Definition of piracy

Piracy consists of any of the following acts:

(a) any illegal acts of violence or detention, or any act of depredation, committed for private ends by the crew or the passengers of a private ship or a private aircraft, and directed:

(i) on the high seas, against another ship or aircraft, or against persons or property on board such ship or aircraft;

(ii) against a ship, aircraft, persons or property in a place outside the jurisdiction of any State;

(b) any act of voluntary participation in the operation of a ship or of an aircraft with knowledge of facts making it a pirate ship or aircraft;

(c) any act of inciting or of intentionally facilitating an act described in subparagraph (a) or (b).

Article 102

Piracy by a warship, government ship or government aircraft whose crew has mutinied

The acts of piracy, as defined in article 101, committed by a warship, government ship or government aircraft whose crew has mutinied and taken control of the ship or aircraft are assimilated to acts committed by a private ship or aircraft.

Article 103

Definition of a pirate ship or aircraft

A ship or aircraft is considered a pirate ship or aircraft if it is intended by the persons in dominant control to be used for the purpose of committing one of the acts referred to in article 101. The same applies if the ship or aircraft has been used to commit any such act, so long as it remains under the control of the persons guilty of that act.

Article 104

Retention or loss of the nationality of a pirate ship or aircraft

A ship or aircraft may retain its nationality although it has become a pirate ship or aircraft. The retention or loss of nationality is determined by the law of the State from which such nationality was derived.

Article 105
Seizure of a pirate ship or aircraft

On the high seas, or in any other place outside the jurisdiction of any State, every State may seize a pirate ship or aircraft, or a ship or aircraft taken by piracy and under the control of pirates, and arrest the persons and seize the property on board. The courts of the State which carried out the seizure may decide upon the penalties to be imposed, and may also determine the action to be taken with regard to the ships, aircraft or property, subject to the rights of third parties acting in good faith.

Article 106
Liability for seizure without adequate grounds

Where the seizure of a ship or aircraft on suspicion of piracy has been effected without adequate grounds, the State making the seizure shall be liable to the State the nationality of which is possessed by the ship or aircraft for any loss or damage caused by the seizure.

Article 107
Ships and aircraft which are entitled to seize on account of piracy

A seizure on account of piracy may be carried out only by warships or military aircraft, or other ships or aircraft clearly marked and identifiable as being on government service and authorized to that effect.

Article 108
Illicit traffic in narcotic drugs or psychotropic substances

1. All States shall co-operate in the suppression of illicit traffic in narcotic drugs and psychotropic substances engaged in by ships on the high seas contrary to international conventions.

2. Any State which has reasonable grounds for believing that a ship flying its flag is engaged in illicit traffic in narcotic drugs or psychotropic substances may request the co-operation of other States to suppress such traffic.

Article 109
Unauthorized broadcasting from the high seas

1. All States shall co-operate in the suppression of unauthorized broadcasting from the high seas.

2. For the purposes of this Convention, "unauthorized broadcasting" means the transmission of sound radio or television broadcasts from a ship or installation on the high seas intended for reception by the general public contrary to international regulations, but excluding the transmission of distress calls.

3. Any person engaged in unauthorized broadcasting may be prosecuted before the court of:

(a) the flag State of the ship;

(b) the State of registry of the installation;

(c) the State of which the person is a national;

(d) any State where the transmissions can be received; or

(e) any State where authorized radio communication is suffering interference.

4. On the high seas, a State having jurisdiction in accordance with paragraph 3 may, in conformity with article 110, arrest any person or ship engaged in unauthorized broadcasting and seize the broadcasting apparatus.

Article 110
Right of visit

1. Except where acts of interference derive from powers conferred by treaty, a warship which encounters on the high seas a foreign ship, other than a ship entitled to complete immunity in accordance with articles 95 and 96, is not justified in boarding it unless there is reasonable ground for suspecting that:

(a) the ship is engaged in piracy;

(b) the ship is engaged in the slave trade;

(c) the ship is engaged in unauthorized broadcasting and the flag State of the warship has jurisdiction under article 109;

(d) the ship is without nationality; or

(e) though flying a foreign flag or refusing to show its flag, the ship is, in reality, of the same nationality as the warship.

2. In the cases provided for in paragraph 1, the warship may proceed to verify the ship's right to fly its flag. To this end, it may send a boat under the command of an officer to the suspected ship. If suspicion remains after the documents have been checked, it may proceed to a further examination on board the ship, which must be carried out with all possible consideration.

3. If the suspicions prove to be unfounded, and provided that the ship boarded has not committed any act justifying them, it shall be compensated for any loss or damage that may have been sustained.

4. These provisions apply mutatis mutandis to military aircraft.

5. These provisions also apply to any other duly authorized ships or aircraft clearly marked and identifiable as being on government service.

Article 111
Right of hot pursuit

1. The hot pursuit of a foreign ship may be undertaken when the competent authorities of the coastal State have good reason to believe that the ship has violated the laws and regulations of that State. Such pursuit must be commenced when the foreign ship or one of its boats is within the internal waters, the archipelagic waters, the territorial sea or the contiguous zone of the pursuing State, and may only be continued outside the territorial sea or the contiguous zone if the pursuit has not been interrupted. It is not necessary that, at the time when the foreign ship within the territorial sea or the contiguous zone receives the order to stop, the ship giving the order should likewise be within the territorial sea or the contiguous zone. If the foreign ship is within a contiguous zone, as defined in article 33, the pursuit may only be undertaken if there has been a violation of the rights for the protection of which the zone was established.

2. The right of hot pursuit shall apply mutatis mutandis to violations in the exclusive economic zone or on the continental shelf, including safety zones around continental shelf installations, of the laws and regulations of the coastal State applicable in accordance with this Convention to the exclusive economic zone or the continental shelf, including such safety zones.

3. The right of hot pursuit ceases as soon as the ship pursued enters the territorial sea of its own State or of a third State.

4. Hot pursuit is not deemed to have begun unless the pursuing ship has satisfied itself by such practicable means as may be available that the ship pursued or one of its boats or other craft working as a team and using the ship pursued as a mother ship is within the limits of the territorial sea, or, as the case may be, within the contiguous zone or the exclusive economic zone or above the continental shelf. The pursuit may only be commenced after a visual or auditory signal to stop has been given at a distance which enables it to be seen or heard by the foreign ship.

5. The right of hot pursuit may be exercised only by warships or military aircraft, or other ships or aircraft clearly marked and identifiable as being on government service and authorized to that effect.

6. Where hot pursuit is effected by an aircraft:

(a) the provisions of paragraphs 1 to 4 shall apply mutatis mutandis;

(b) the aircraft giving the order to stop must itself actively pursue the ship until a ship or another aircraft of the coastal State, summoned by the aircraft, arrives to take over the pursuit, unless the aircraft is itself able to arrest the ship. It does not suffice to justify an arrest outside the territorial sea that the ship was merely sighted by the aircraft as an offender or suspected offender, if it was not both ordered to stop and pursued by the aircraft itself or other aircraft or ships which continue the pursuit without interruption.

7. The release of a ship arrested within the jurisdiction of a State and escorted to a port of that State for the purposes of an inquiry before the competent authorities may not be claimed solely on the ground that the ship, in the course of its voyage, was escorted across a portion of the exclusive economic zone or the high seas, if the circumstances rendered this necessary.

8. Where a ship has been stopped or arrested outside the territorial sea in circumstances which do not justify the exercise of the right of hot pursuit, it shall be compensated for any loss or damage that may have been thereby sustained.

Article 112
Right to lay submarine cables and pipelines

1. All States are entitled to lay submarine cables and pipelines on the bed of the high seas beyond the continental shelf.

2. Article 79, paragraph 5, applies to such cables and pipelines.

Article 113
Breaking or injury of a submarine cable or pipeline

Every State shall adopt the laws and regulations necessary to provide that the breaking or injury by a ship flying its flag or by a person subject to its jurisdiction of a submarine cable beneath the high seas done wilfully or through culpable negligence, in such a manner as to be liable to interrupt or obstruct telegraphic or telephonic communications, and similarly the breaking or injury of a submarine pipeline or high-voltage power cable, shall be a punishable offence. This provision shall apply also to conduct calculated or likely to result in such breaking or injury. However, it shall not apply to any break or injury caused by persons who acted merely with the legitimate object of saving their lives or their ships, after having taken all necessary precautions to avoid such break or injury.

Article 114
Breaking or injury by owners of a submarine cable or pipeline of another submarine cable or pipeline

Every State shall adopt the laws and regulations necessary to provide that, if persons subject to its jurisdiction who are the owners of a submarine cable or pipeline beneath the high seas, in laying or repairing that cable or pipeline, cause a break in or injury to another cable or pipeline, they shall bear the cost of the repairs.

Article 115
Indemnity for loss incurred in avoiding injury to a submarine cable or pipeline

Every State shall adopt the laws and regulations necessary to ensure that the owners of ships who can prove that they have sacrificed an anchor, a net or any other fishing gear, in order to avoid injuring a submarine cable or pipeline, shall be indemnified by the owner of the cable or pipeline, provided that the owner of the ship has taken all reasonable precautionary measures beforehand.

SECTION 2. CONSERVATION AND MANAGEMENT OF THE LIVING RESOURCES OF THE HIGH SEAS

Article 116
Right to fish on the high seas

All States have the right for their nationals to engage in fishing on the high seas subject to:

(a) their treaty obligations;

(b) the rights and duties as well as the interests of coastal States provided for, inter alia, in article 63, paragraph 2, and articles 64 to 67; and

(c) the provisions of this section.

Article 117
Duty of States to adopt with respect to their nationals measures for the conservation of the living resources of the high seas

All States have the duty to take, or to co-operate with other States in taking, such measures for their respective nationals as may be necessary for the conservation of the living resources of the high seas.

Article 118
Co-operation of States in the conservation and management of living resources

States shall co-operate with each other in the conservation and management of living resources in the areas of the high seas. States whose nationals exploit identical living resources, or different living resources in the same area, shall enter into negotiations with a view to taking the measures necessary for the conservation of the living resources concerned. They shall, as appropriate, co-operate to establish subregional or regional fisheries organizations to this end.

Article 119
Conservation of the living resources of the high seas

1. In determining the allowable catch and establishing other conservation measures for the living resources in the high seas, States shall:

(a) take measures which are designed, on the best scientific evidence available to the States concerned, to maintain or restore populations of harvested species at levels which can produce the maximum sustainable yield, as qualified by relevant environmental and economic factors, including the special requirements of developing States, and taking into account fishing patterns, the interdependence of stocks and any generally recommended international minimum standards, whether subregional, regional or global;

(b) take into consideration the effects on species associated with or dependent upon harvested species with a view to maintaining or restoring populations of such associated or dependent species above levels at which their reproduction may become seriously threatened.

2. Available scientific information, catch and fishing effort statistics, and other data relevant to the conservation of fish stocks shall be contributed and exchanged on a regular basis through competent international organizations, whether subregional, regional or global, where appropriate and with participation by all States concerned.

3. States concerned shall ensure that conservation measures and their implementation do not discriminate in form or in fact against the fishermen of any State.

Article 120
Marine mammals

Article 65 also applies to the conservation and management of marine mammals in the high seas.

ANNEX II

NORTHWEST ATLANTIC FISHERIES ORGANIZATION

Serial Nº N1856 **NAFO/GC Doc.90/8**

12TH ANNUAL MEETING - SEPTEMBER 1990

EEC/CANADIAN PROPOSAL

RESOLUTION FOR NAFO GENERAL COUNCIL

NON-NAFO FISHING ACTIVITIES

Recalling Article 116 of the United Nations Convention on the Law of the Sea stating that the right of all States for their nationals to engage in fishing on the high seas is subject to certain conditions:

Recalling Article 117 of that Convention requiring States to take or cooperate with other States in taking such measures for their respective nationals as may be necessary for the conservation of the living resources of the high seas, and Article 118 which provides that States shall cooperate with each other in the conservation and management of living resources in the areas of high seas;

Recalling Article 63.2 of that Convention providing that where the same stock or stocks of associated species occur both within the exclusive economic zone and in an area beyond and adjacent to the zone, the coastal State and the States fishing for such stocks in the adjacent area shall seek, either directly or through appropriate sub-regional or regional organizations, to agree upon the measures necessary for the conservation of these stocks in the adjacent area;

Recalling that according to Article 119.2 of that Convention available scientific information, catch and fishing effort statistics, and other data relevant to the conservation of fish stocks shall be contributed and exchanged on a regular basis through competent international organizations, whether sub-regional, regional or global, where appropriate and with participation by all States concerned;

Considering that the Northwest Atlantic Fisheries Organization is the competent regional fisheries organization for the conservation and rational management of fish resources in the NAFO Regulatory Area;

Recalling Article XIX of the NAFO Convention in which the Contracting Parties agree to invite the attention of any State not a Party to the Convention to matters relating to fishing activities in the Regulatory Area of the nationals or vessels of that State which appear to affect adversely the attainment of the objectives of the Convention;

Recalling the resolution adopted by the Fisheries Commission of NAFO on June 7, 1979 calling on all Contracting Parties to take all practicable steps to prevent arrangements between their nationals and vessels flying the flags of States which are not members of NAFO, where such arrangements involve fishing in the Regulatory Area;

Noting that an increasing number of vessels of States not party to the Convention have been fishing in the Regulatory Area, representing a serious threat to the conservation and rational management of stocks;

Noting further that at least some of the catch of these vessels is landed or sold in States being Contracting Parties;

Declares that all members of the international community whose nationals carry out fishing activities in the NAFO Regulatory Area should ensure that such activities do not have an adverse impact on the stocks or NAFO's ability to ensure conservation; and

resolves that:

(1) All Contracting Parties should communicate through diplomatic channels with non-Contracting Parties whose vessels fish in the NAFO Regulatory Area to request that they take all necessary measures to prevent any fishing contrary to NAFO conservation measures;

(2) The Executive Secretary of NAFO draws to the attention of the non-Contracting Parties involved the activities of their vessels in the Regulatory Area, and the negative impact of such fishing on the conservation of fish stocks in the Regulatory Area;

(3) The Executive Secretary and contracting Parties individually contact non-Contracting Parties, whose vessels fish in the Regulatory Area, to request them to provide NAFO with complete and accurate statistical reports on their catches in the NAFO Regulatory Area to the end of 1990;

(4) All Contracting Parties should take effective measures to reduce the benefits of any fishing activities undertaken by vessels from non-

Contracting Parties in the NAFO Regulatory Area where such fisheries take place contrary to NAFO conservation measures, with the aim of causing them to withdraw from such activities;

(5) In full respect of the international obligations of Contracting Parties, further measures should be developed for consideration by the General Council at its 1991 annual meeting, including the possibility of introducing a system under which all Contracting Parties would require that all fish and fish products of a species managed by NAFO, imported from non-Contracting Parties whose vessels fish in the NAFO Regulatory Area, be accompanied by a certificate indicating harvest origin outside that Area.

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